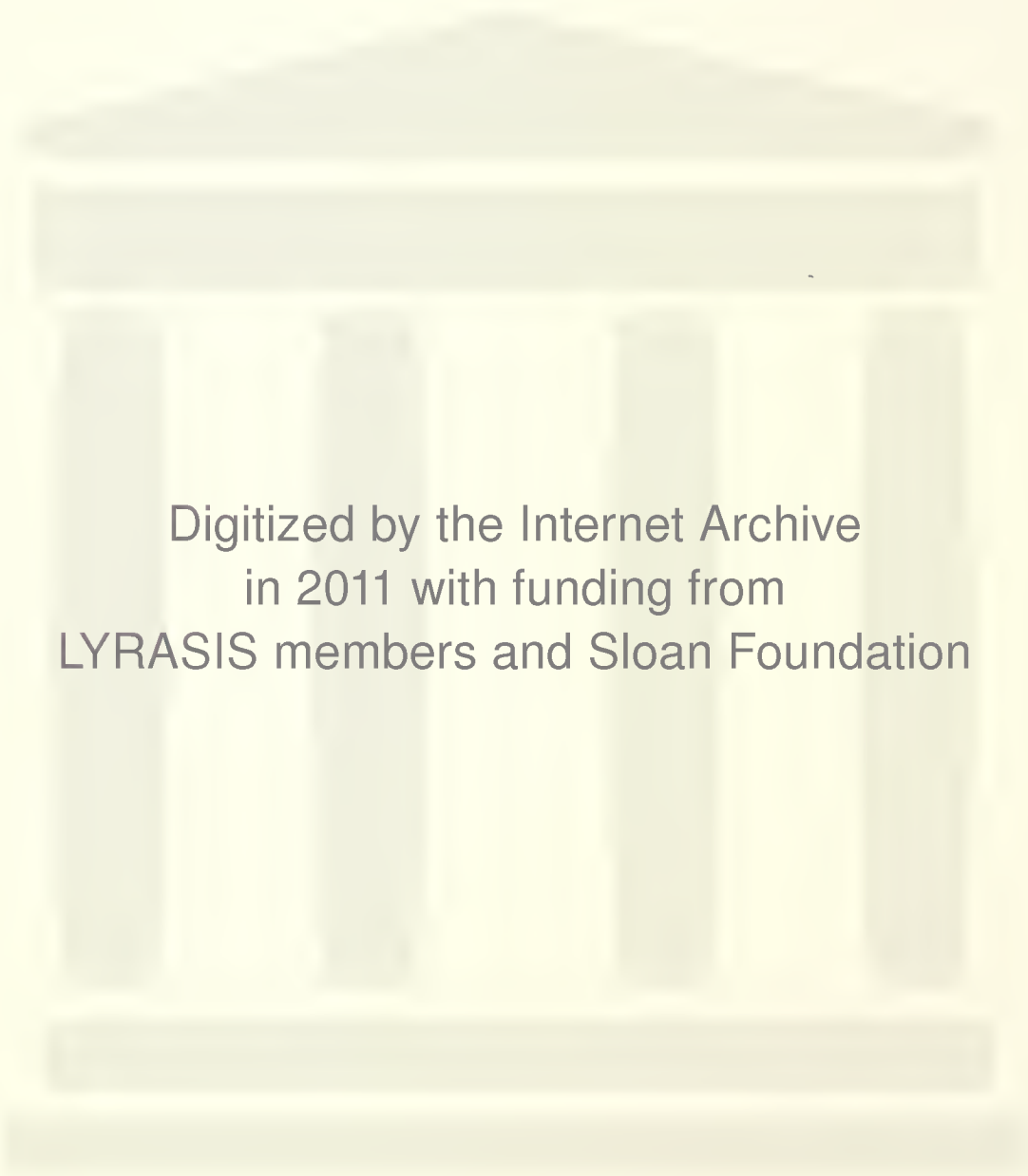


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1964

11th Biennial Report

1964 / 1965





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*Louisiana Wild Life
and Fisheries Commission*

— 11th —

**Biennial
Report**

1964 / 1965

Published by

LOUISIANA WILD LIFE AND
FISHERIES COMMISSION

WILD LIFE AND FISHERIES BUILDING
400 ROYAL STREET
NEW ORLEANS, LOUISIANA 70130

Fellow Citizens of Louisiana

The two year period covered by this report of the Louisiana Wild Life and Fisheries Commission reflects considerable progress during this administration at a time when ever-growing demands are being made upon wildlife resources both at sporting and commercial levels.

At a time when there is more awareness at a national level for outdoor recreation, Louisiana's record along this line stands out as a bright example of what can be done, and what is being done.

Today's concept of game and fish management is such that the accomplishments of the Louisiana Wild Life and Fisheries during those two years have already produced much needed results to benefit present generations. Even so, there is great satisfaction in knowing that we are improving on existing conditions and that future generations will be assured of outdoor activities for all time to come.

That is the real challenge that faces the Louisiana Wild Life and Fisheries Commission. It is well and good to properly manage present wildlife and fisheries resources, but the programs that have been expanded or initiated during the two years covered by this report are geared to perpetuate and improve these important resources.

Additional tracts of fine wildlife habitat have been purchased outright or taken under long-term lease at no cost to the Commission, to be managed wisely and well for the people of Louisiana and for generations to come.

In addition to land acquisition, there has been an extensive boat launching ramp program, providing access to many areas formerly too remote to be utilized.

At the same time, research was accelerated on shrimp, oysters and other seafood. The Commission's Marine Research Laboratory at Grand Terre is one of the finest in the country.

During the two-year period being reported upon, hunter use of Game Management Areas has increased by a third, indicative of the need of the people for this sort of managed recreation.

Most satisfying has been wide recognition of the accomplishment of the Commission by the public.



John F. McKeithen



J. D. HAIR, JR.
DIRECTOR

RICHARD K. YANCEY
ASSISTANT DIRECTOR

LYLE S. ST. AMANT
ASSISTANT DIRECTOR

State of Louisiana

WILD LIFE AND FISHERIES COMMISSION

400 ROYAL STREET

NEW ORLEANS 70130

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WEST MONROE

H. CLAY WRIGHT
EVERGREEN

May 1, 1966

His Excellency, The Governor of Louisiana
The Honorable Members of the Legislature
State Capitol
Baton Rouge, Louisiana

Gentlemen:

The Louisiana Wild Life and Fisheries Commission is pleased to present to you and the people of our State its eleventh Biennial Report covering the calendar years ending December 31, 1964 and December 31, 1965.

In presenting this program of progress in the wildlife resource field, the Wild Life and Fisheries Commission realizes that credit for these accomplishments must be shared with the Governor's Office, the Legislature, other State Agencies, news media, sportsmen's organizations, and many other organized groups and individuals who have volunteered such excellent assistance and co-operation.

I hereby take this opportunity to express for the Members of the Commission, its staff and myself our sincere appreciation for assistance in keeping Louisiana a "Sportsman's Paradise".

Very respectfully yours,

J. D. Hair, Jr.,
Director

LOUISIANA WILD LIFE AND FISHERIES COMMISSION

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*Ray Whatley, Chairman, May 26, 1964—February 23, 1965

*John E. Kyle, Jr., Chairman, March 23, 1965—October 26, 1965

J. D. HAIR, JR.
Director

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Oysters, Water Bottoms and Seafood

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FRANK GIPSON
Attorney

LOUISIANA WILD LIFE
AND
FISHERIES
COMMISSION



JIMMIE THOMPSON



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A. J. BUQUET



H. B. FAIRCHILD



H. CLAY WRIGHT



JOHN E. KYLE, JR.



JOHN PAUL CRAIN

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Administration

THE PAST TWO YEARS have seen a new look for the Louisiana Wild Life and Fisheries Commission, a new public image that is reflected in the results of management policies, accelerated research and other accomplishments which are the direct result of long range planning and positive follow through.

The Commission is geared to meet the growing demands of persons seeking outdoor recreations in the form of hunting, fishing, boating and other outdoor pursuits. It has also increased and intensified its overall research program to benefit not only sportsmen but also those individuals in Louisiana who depend upon fisheries and wildlife resources for a livelihood. Reference here is made to trappers, shrimpers, oyster fishermen and commercial fishermen in both fresh water lakes, river and streams, and in salt water estuarine and gulf waters.

To name but a few of the many programs in which the Commission has been engaged, it should be cited that progress was made in acquiring by lease new areas for game management for the public; the boat launching facility program was greatly accelerated; deer and turkey restocking programs continued to; research was expanded at the Commission's marine laboratory at Grand Terre and elsewhere in the state; important steps were taken to curb pollution; refuges were improved and efforts were made to revive the State's fur industry and to expand the companion industry related to the sale of nutria meat to mink ranches and pet food manufacturers.

These and many other programs will be adequately covered in the pages that follow; however, a few of the aforementioned accomplishments should be elaborated on at this time.

Mention was made of land acquisition. Perhaps the most outstanding land acquisition made by the Commission during the two periods being covered in this biennial report was outright purchase of 50,000 acres of land in LaSalle and Catahoula parishes for permanent use as a wildlife management area, dedicated to increased development of game populations in central Louisiana and as an outlet for fishing, hunting and other recreational sports.

The Act of Sale took place on March 4, 1964 and the initial tract consisted of 48,679 acres in LaSalle Parish and 1,340 acres in Catahoula Parish. Money for the purchase, amounting to \$29 an acre, came from the Russell Sage Foundation funds which are dedicated to the Louisiana Wild Life and Fisheries Commission for the purpose of wildlife conservation projects in the state.



J. D. HAIR
Director

Cost per acre for the tract was the same as the amount paid for the Russell Sage Wildlife Management Area near Monroe, now providing excellent outdoor recreational opportunities for the people of the state.

At that time, the Commission also took an option on an adjacent 10,256 acres in Catahoula Parish. The option was exercised in September of the same year, bringing the total acreage of the Saline Wildlife Management Area to slightly more than 60,000 acres, an area that for all time will be managed for recreational purposes.

Another major area for wildlife management was acquired in October of 1964 when the Commission leased a 41,980 tract in Morehouse Parish through the courtesy of the Georgia-Pacific Corporation and Mr. John Barton. This new Game Management Area is located on the East Bank of the Ouachita River and is comprised of parts of the former Terzia Refuge.

In 1965, an additional area was obtained by lease from the U. S. Corps of Engineers. It is the 3,800-acre Bonnet Carre Public Shooting Ground



R. K. YANCEY
Assistant Director

in St. Charles Parish, between Norco and LaPlace on U. S. Highway 61, the Airline Highway.

A diversity of game, both resident and migratory, can be found in the area during the year. Squirrels are located in the woody areas on both sides of the spillway's levee boundaries. Rabbits are scattered throughout the entire floodway. There are some quail present but they are not abundant.

Transients, such as doves, woodcock, ducks, coots, snipe and rails are found in varying numbers during the winter months. These birds may be plentiful one day and scarce the next. Weather conditions have a lot to do with hunter success in this area.

Fishing for black bass and sunfish in the pits and sloughs on the Bonnet Carre tract is an attraction for many anglers. There's also good crawfishing and berry picking in the spring and early summer months.

Building of boat launching ramps on the largest scale to date was made possible by the Accelerated Public Works Program, wherein federal money was made available on a 50-50 matching basis. It should be pointed out that APW projects were initiated for the primary purpose of furnishing employment in parishes designated as economically distressed areas. There were 31 of the 64 parishes declared as such and consequently eligible for APW assistance.

In selecting those projects which would benefit the most people and at the same time fill a long standing need, the Commission quickly realized the construction of boat launching facilities would offer the best potential.

Roughly 40 of those ramps, each with an adjacent parking area, and many with loading piers, have been completed. An additional seven were approved for construction and work progressed as this report was prepared. By the time it is delivered from the printer, just under 50 ramps will be operating.

The Louisiana Wild Life and Fisheries Commission has every desire to see the boat ramp program continued, not only in a limited number of parishes but in each parish where there is a potential for furnishing more and better recreation through improved access to public fishing and boating waters.

As of March 1, 1965, the APW program officially ended, but all jobs under way and those approved prior to the date are completed or in the final stages of completion.

If sufficient funds are available in the coming budget the Commission will consider as many requests as possible that came in after the start of the program but which asked for launching facilities in unqualified parishes.

Louisiana has long been considered the most important state seeking wise management of the continental waterfowl populations. Its Commis-

sion has been a vital force in pressing for reasonable liberalization of duck hunting restrictions.

To that end, every effort was made to have full inspection of the marshes of Louisiana which are winter host to approximately 25 per cent of the continental waterfowl.

On December 10 of 1964, members of the important House Subcommittee on Fisheries and Wildlife Conservation, then headed by the late Congressman T. A. Thompson, visited Louisiana for several days to tour refuges and marshes and observe firsthand the waterfowl present and the importance of the state as wintering grounds. In the group was Congressman John D. Dingell, Michigan, who now heads that House subcommittee.

Secretary of the Interior Stewart L. Udall also visited Louisiana in May, 1964 to tour the coastal marshes and southwest Louisiana. During the course of his visit, Secretary Udall visited Rockefeller Refuge, touring the refuge by small seaplane and marsh buggy. In an address in Lake Charles, Secretary Udall praised the Louisiana Wild Life and Fisheries Commission for its outstanding progress in sound conservation and wise utilization of wildlife resources.

In keeping with its policy of impressing upon federal agencies, officials and members of Congress the importance of Louisiana in overall management of waterfowl, Louisiana was host to John S. Gottschalk, new director of the U. S. Fish and Wildlife Service's Bureau of Sport Fisheries and Wildlife. Gottschalk spent four days touring Louisiana's marshes and refuges. He stayed at Rockefeller Refuge for two days.

Although Louisiana has had to spearhead an annual fight to liberalize duck hunting seasons, there is little doubt that the visits of members of the House Subcommittee on Fisheries and Wildlife Conservation, the visit of Secretary of the Interior Udall, and the visit of John S. Gottschalk, all helped in forestalling even more drastic curtailment.

Undoubtedly one of the most important accomplishments by the Commission was in 1965 when a series of inservice training schools were carried out. Four two-week courses were held on the LSU campus under a program of training sponsored by the Commission with full assistance from the University Extension Service. At each two-week session, Commission personnel lived on the campus and put in 10-hour days.

This important program covered everything from lectures on wildlife and fisheries management to instruction in first aid, self defense, courtesy and a hundred other subjects too numerous to list.

As a result, the hundreds of employees who graduated during the four courses are better trained, better informed and more capable of carrying out the many diversified and compli-

cated duties that go with management of perhaps the most important public asset that the state has.

Newly designed uniforms were issued to Commission personnel during 1965. Coupled with the intensive training, new uniforms and new programs instituted during the period being covered, there is a new spirit among Commission personnel. It is reflected in all Commission activities and has done much to shape the new public image of the Louisiana Wild Life and Fisheries Commission.

In view of the stunning fact that Hurricane Betsy proved to be the worst disaster to befall Louisiana since the Civil War ended in the Appomattox Court House a century ago this year, it is appropriate to let the people of Louisiana know what their Louisiana Wild Life and Fisheries Commission was doing during and after one of the most destructive storm ever to strike America.

Since that day one hundred years ago when General Robert E. Lee surrendered to General Ulysses S. Grant and the long slow process of rebuilding the ravages of war, there has never been a period in the history of the state where personal losses of property have been so great.

Now, as then, the good people of Louisiana have accepted their losses and are looking toward the future, painstakingly clearing away untold millions of dollars of rubble. A bigger and more prosperous Louisiana will emerge.

One thing is certain. The Louisiana Wild Life and Fisheries Commission played a far greater role in rescue, communications, rehabilitation and coordination of activities among other agencies than many of our readers know.

The Louisiana Wild Life and Fisheries Commission worked untiringly for days on end to assist stricken areas.

A total of 192 Commission employees, many drawn from distant parts of the state, put in a minimum of 32,456 man hours in the five battered parishes of Plaquemines, St. Bernard, Orleans, Terrebonne and Lafourche.

During the two week period immediately following Hurricane Betsy, 127 vehicles including automobiles and trucks equipped with two-way radios operated night and day in those parishes mentioned. A total of 61 boats, ranging from the Commission's largest patrol vessels to trailered craft of all sizes, were deployed to disaster areas.

At a time when quite a few Commission people were left homeless and their possessions were totally destroyed by the brutal bludgeons of Betsy they worked night and day to assist others. They rank among the unsung heroes in a major disaster who want no praise for what they did and who regret that they were unable to do more.

The Commission is proud of those men and

what they accomplished. But worthy of mention is the fact that all personnel were alerted prior to the passage of the hurricane and as soon as it passed they were on their way to assigned areas to do whatever had to be done.

The importance of the Commission's radio communications system proved its value beyond any shadow of doubt. The Patrol Boats Zoric, Captain Sandras, Tarpon, C.W.C. 1, and the Brant were dispatched immediately to Grand Isle, Venice and Pass-a-Loutre stations, establishing the first complete communications system to relay information about conditions on the ground and requests for equipment and supplies. Radio towers operated around the clock relaying messages for agencies other than the Commission that were engaged in emergency work.

Commission airplanes flew constantly, reporting on distress areas, available routes for motor vehicles pulling Commission boats on trailers, and flying supplies of food, electric generators and other supplies into the areas below New Orleans which were virtually wiped out.

It is impossible to express in detail many of the tasks that were performed by Commission personnel. In many cases Commission personnel worked as much as five days and nights with only a few hours sleep and on scant rations. They came through with flying colors, greatly enhancing the public image of the Louisiana Wild Life and Fisheries Commission.

It can be seen that while much has been accomplished in the past two years, there will be greater demands in the years ahead. All programs of the Commission should be geared along that line. It is anticipated that the number of hunters and fishermen will double by the turn of the century. Initial efforts now will lay the groundwork for the vast demands that will be made by persons seeking all forms of outdoor recreation in the future.

Conservation School

In a widespread organization such as the Louisiana Wild Life and Fisheries Commission it is not only important that individuals know their own jobs, but it is also necessary they have a pretty good idea of what their fellow employees are doing and, most important, what policy to follow. This is an essential part of good personnel management. With this and other things in mind the Commission held a series of four in-service training schools in cooperation with Louisiana State University.

Each of the four school terms were for two week periods with lectures and forums, motion pictures and other visual aids each day—Mondays through Fridays at Pleasant Hall on the Baton Rouge campus. The four classes, lasting two

weeks each, were held between February 22 and May 21, 1965.

Those attending came from all parts of the state and were drawn from all divisions. They were housed in a campus dormitory. Meals were served "on the house" three times daily; coffee breaks occasionally. All Commission personnel attending were impressed with the fact that theirs was an important job and vital to the functioning of the state agency.

On Monday of the first session the new students were welcomed to LSU by Dr. Paul Y. Burns, Dr. James H. Perry and Dr. Robert J. Muncy of the LSU School of Forestry. This was followed by the first session and Dr. Lyle St. Amant, chief of the Oysters, Waterbottoms and Seafood Division, first speaker up, lectured on Louisiana's Coastal Resources.

"With the exception of oil and gas our fisheries are Louisiana's largest industry," Dr. St. Amant told the classes which were attended by at least 90 percent of the entire personnel of the commission.

"Our three principal species of shrimp produce 60 to 80 million pounds annually; oysters 10 to 15 million pounds annually and total production of all species is 700 million to 1 billion, 100 million pounds".

"The northern Gulf of Mexico produces 31 percent of all fishery poundage in the United States and about 38 to 40 percent of all fishery value in this country. Louisiana production makes the biggest part of this total," Dr. St. Amant told fellow employees.

Steve Harmon, Chief of the Education and Publicity division spoke on the "History of the Louisiana Wild Life and Fisheries Commission" and pointed out that the commission was an outgrowth of a group constituted in 1872; and which was known as the Oyster Commission. "However," Harmon added, "research on record shows that this group had an even earlier parent constituted in 1857, which makes ours rank among the pioneer wildlife conservation bodies in our nation."

Joe L. Herring, chief of the Fish and Game Division, spoke on "Wildlife and Fisheries Work Programs." His talk was accompanied by visual aids.

"The past few years have witnessed the development of a new profession, that of wildlife management," Herring said. "The Wildlife management field, as it now has developed, is based on the concept of multiple land use. Much of the game now harvested in the United States must be produced as a secondary product of the land along with other products such as timber or agricultural crops," Herring told the classes.

Richard K. Yancey, assistant director, spoke on "Commission Organization and Authority". Yancey's talk clearly defined the division and

chain of authority in the Wild Life and Fisheries Commission and was accompanied by visual charts on a screen. Later students were given copies of these charts to place in their notebooks.

Frank Carroll, Director of the University College, under whose invitation and supervision the in-training schools were held, delivered a one hour talk on "Basic Supervision."

During the first afternoon sessions Paul Gray of the LSU Department of Speech delivered a talk on "Oral Communications" and Roy Shaefer, Secretary of the Louisiana State Employees Retirement System, spoke on the "Retirement Policy". John E. Leibert of the Department of Civil Service for Louisiana explained and clarified some of the Civil Service rules and regulations.

At the 7 P.M. session Captain Richard Horton, of the State Police Department, explained the why's and wherefore's of "Finger Printing". This was accompanied by actual demonstrations of the technique.

At the opening session McFadden Duffy, staff writer for the Louisiana Conservationist, spoke on "news release policies". This was followed by a talk by Steve Harmon on "policy of magazine."

Sam C. Murray, Wildlife Instructor, who with Coburn Hood, assistant to the director, acted as coordinators for the school, spoke on "Courtesy and School Programs." Other features of the morning program were a talk on displays and the film library by Wildlife Instructor Vincent Pizzoloto, instruction on "Photography" by Staff Photographer Robert Dennie and a talk on the "Museum Schedule" by Steve Harmon. "Averaging 100,000 visitors a year from every state in the Union and most foreign countries, it is our hope that the museum has increased interest in wildlife in all age groups and taught the need for conserving our diminishing wildlife," Harmon said. "Eight hundred and seventy nine specimens and a collection of birds' eggs are on display at the Commission's headquarters in New Orleans."

Late morning, afternoon and night sessions were conducted by Roger Hunter, Supervisor of Revenue for the Commission, and Leonard New, assistant chief of the Enforcement Division, spoke on "Sport Fishing Laws." Larry Cook, Chief Accountant, also from the Commission, spoke on "Wildlife Regulations". Mr. Cook gave the complete rundown on how to handle time sheets, sick leave, accident reports and routine paper work most essential to the employees and management operation. These talks were followed by a tour of the LSU Campus and later Hunter conducted a "Fishing Law Panel" at the night's session.

Early sessions featured talks by Claude LeBlanc, superintendent of the "Wharf" accompanied by motion pictures and slides featuring boating safety and care of equipment.

Captain James L. Buckner and Joseph W. Deytens of the U. S. Army R.O.T.C. Detachment

at LSU, discussed map reading. Joe L. Herring spoke on "Archery Equipment." The entire afternoon, after lunch, was devoted to firearms practice on the LSU range. After dinner, Robert Smothers, chief of the radio section, spoke on "Communications."

Fridays were short days for the students, first class was conducted by Ted O'Neil, Chief of the Fur Division. O'Neil spoke on the outlook of the fur industry in Louisiana and other aspects of the trade and "Louisiana's Trapping Laws."

Joe L. Herring followed with an hour's discussion of "Game Laws." A short program was presented by Civil Defense representatives Bentley J. McKay, Jr., Jack Bates, veteran federal game agent closed the program for the week with an hour's talk and the students departed to their homes for the week-end.

The second week's schedule began with a talk by Robert LaFleur, chief of the water pollution division. LaFleur spoke on the "Characteristics of Water Pollution and Indications of its Presence." He outlined the steps which should be taken by those appealed to for its arrest, abatement and attention.

The rest of the sessions were concerned with lectures on game management ending with a talk by Allan Ensminger, Chief of the Refuge Division. On the game management programs were Dr. Bryant Bateman, Professor Game Management, LSU; Dr. Leslie Glasgow, LSU and John D. Newsom, former Chief of the Fish and Game Division, now director of the co-operative wildlife unit at LSU. Dr. Glasgow delivered two papers and Newsom, four. Dr. Robert J. Muncy of the LSU school of Forestry spoke at the night session accompanying his talk with a general discussion and a film.

Tuesday morning's sessions were devoted to Freshwater Fish Management with papers read by Dr. Muncy and Dr. O'Neal Smitherman, leader of the co-operative fisheries unit at LSU. This was followed by a talk by William Herke of the U. S. Fish and Wildlife Service which was also on Freshwater Fish Management. The rest of the afternoon was devoted to lectures by Dr. St. Amant on "Marine Shellfish and Fish Management." Joe L. Herring closed the day's program with a "Fish Management Panel".

Wednesday was devoted to the methods used by the law from simple arrests to personal defense in which students were shown the latest Karate and Judo methods of defense. This class was conducted by officers Tony Martello and Charles Bayley of City of Baton Rouge Police. Stanley Sbozen of the State Highway Department, aided by the representatives of the American Red Cross, conducted classes and gave a lecture on the essentials of first aid.

On the early programs were featured "The Laws of Arrest" by Julian Martin, Director of

Law Enforcement at LSU, "Routine Patrol" by Wally Moll, of U. S. Internal Revenue Service, "Gathering and Preserving Evidence," by Ray Herd, of Louisiana Department of Public Safety, "Interviews, Statements and Confessions" by Captain Mark Cambre, of Louisiana State Police.

Thursday's classes concerned "Note Taking and Report Writing", "Search and Seizure", "Law of Evidence", and "Where Cases are Tried". All of the day's sessions were conducted by commission attorney Frank Klein. These were followed by the final examination prepared by Dr. Muncy.

Friday morning sessions were also presided over by attorney Klein and this was followed by a review of the previous day's examinations by Dr. Muncy. Dr. Muncy explained that no grades were given because the examinations were given to form conclusions as to how the classes had succeeded.

Last activity of the school was the graduation luncheon at which students were presented with their diplomas.

Building

The Louisiana Wild Life and Fisheries Commission Building, formerly known as the Civil Courts Building, was purchased from the City of New Orleans on August 6, 1957 at a cost of \$1,100,000. Included in the purchase price was the Juvenile Courts Building just across from the Wild Life and Fisheries Commission Building on Chartres Street.

The purchase was an excellent one from an investment standpoint. The State of Louisiana had contributed \$1,250,000 over a period of five decades towards its share of the maintenance, making a great expenditure when consideration is given to the fact that original cost of the gleaming marble building was \$2,000,000.



RUDY DUVILLE
Building Superintendent

Due to its strategic location, occupying the entire 400 block of Royal Street in New Orleans' tourist-jammed French Quarter, it is estimated that the property alone is today valued well in excess of the purchase cost to the Commission.

The present life expectancy of the building at the time the Commission purchased it was placed at 75 years more before it would show any signs of marked deterioration. Even this is being prevented by better than normal upkeep.

So, in 1957, the huge building which had been operated for decades on a fifty-fifty basis by the City of New Orleans and the State of Louisiana became the sole property of the State agency. This provided badly needed room for expansion of the Commission's cramped quarters in the building.

In those expansion plans, the Louisiana Wildlife Museum was established, occupying a large part of the Royal Street side of the building. There are millions of tourists annually in New Orleans and it can safely be said that few tourists, if any, fail to stroll down Royal Street visiting antique shops, restaurants that are world famous, art shops and numerous historic buildings that played colorful roles in the early history of Louisiana.

As a result, approximately a million persons have visited the wildlife museum since it opened its doors several years ago. Not only has the museum served to convey the Louisiana wildlife story to the visiting public; but also it has proved highly educational to several hundred thousand school children. Many groups from all parts of the state come by bus to spend a day in New Orleans which always includes a tour of the wildlife museum.

Added to the general expansion of Commission facilities in the main office in New Orleans, following purchase of the building, was installation of a fisheries research laboratory.

The Louisiana Wild Life and Fisheries Commission utilizes the first floor of the building and the curator of the wildlife museum has an office and workshop on the second floor. Other agencies located on the second floor include the Greater New Orleans Tourist Commission, the Orleans Levee Board, State Probation and Parole Board, State Division of Administration, Louisiana State Police Narcotics Division, the State Archives Office, the Alcoholic Beverage Control Board, and the State Financial Assistance Office. U.S. District Courts, and the U.S. 5th District Court of Appeals are located on the fourth and third floors respectively. Two additional offices of the Federal Courts are located on the second floor.

There are 22 persons, including a Building Superintendent, in charge of maintenance and custodial work, including operation of the elevators and watchman service.

Aviation Section

The Aviation Section has played a very active role in the overall Commission program during the past two years. Headquartered at the Lakefront Airport in New Orleans both land and sea-planes are available for flights at a moment's notice to any area in the state.

Equipment includes two twin-engine amphibious Grumann widgeons, two single-engine Cessna land planes, one single-engine Cessna float plane, and one super cub. Two experienced full time pilots, Preston E. Davis and Leo Rodriguez, and one part time pilot, Nelson Summerell, are on the job at all times for flights involving a variety of problems which range from pollution control and law enforcement to search and rescue operations following the aftermath of hurricanes or other disasters either natural or manmade.

Enforcement of the State's marine seafood laws continues to be one of the major roles of the Aviation Section. Out of season shrimp trawling and other violations of this type in Louisiana's four million acres of coastal marshes can be adequately controlled only through the extensive use of airplanes working in conjunction with the Commission's watercraft. Without the use of aircraft to spot illegal trawling in the countless thousands of bayous and small bays it would be exceedingly difficult, if not impossible, to control this activity. With a rapid increase in industrialization of our coastal marshes, use of aircraft in the past two years for spotting pollution has become virtually indispensable. Oil spillages, broken pipelines, etc. can be quickly spotted by air in even the remotest coastal areas. Reports over the Commission radio network can then be



Commission agents prepare for take off patrol during closed shrimp season in one of the Commission's planes.



Commission aircraft are used for spotting pollution, game censuses, enforcement work, shrimp sampling, habitat evaluation & search & rescue missions during emergencies such as Hurricane "Betsy".

submitted in order to have corrective action initiated immediately.

Game survey work also continues to place a heavy demand on the Aviation Section. Aerial surveillance of one million three hundred thousand acres of forest lands and marshes that the Commission has under management and scattered about over the State is a major job.

Rapid transport of game birds such as wild turkey and eggs of fish such as wall-eyed pike and striped bass is essential to the survival of these species and the success of such operations. Readily available aircraft are necessary in order that these types of fish and game can be moved immediately upon becoming available.

Aircraft have also been used extensively in carrying out shrimp research operations in the past two years. Migration of post-larval shrimp were checked weekly during the spring and summer months by means of a small float plane operating along the south east Louisiana Coast. The availability of this airplane meant that the accuracy of the sampling could be greatly increased since one trained biologist could make the samples from the float plane at a number of points throughout the marshes in one day's flying. This information in turn is used to assist in accurately determining the dates for opening the spring trawling season which means millions of dollars to Louisiana's seafood industry.

State-wide censuses of waterfowl are made twice monthly by air during the fall, winter and spring. This information has proved to be essential in properly managing waterfowl and securing reasonable duck hunting regulations from the authorities in Washington. Without this work in the past there is little doubt that Louisiana would have experienced closed duck hunting seasons in the past three or four years.

Following the aftermath of Hurricane "Betsy" Commission aircraft were used for search and rescue operations as they were following Hurricanes "Audrey" and "Carla". Spotting of stranded persons in flooded areas for later pickup by Commission boats were an important role of the Aviation Section after "Betsy".

The Aviation Section averages about 15,000 miles of flying each month. Maintenance work is handled through the issuance of purchase orders to licensed aviation repair shops and no accidents or loss of aircraft occurred during the past two years except for one super cub which was destroyed by Hurricane "Betsy" but compensated for fully by insurance.

With an increase in fish and game problems predicted in the years ahead the demands on the Aviation Section will no doubt be amplified proportionately. With constant updating of equipment the Section will stand ready to accomplish the jobs that it is called upon to do.

The Wharf

Trouble shooting is one of the main features of the "Wharf", officially known as the Marine and Radio Repair department of the Commission, which is located at New Orleans on the New Basin Canal, near Lake Pontchartrain. For the past two years the Wharf has not only been charged with usual maintenance problems but two severe storms during that period have also added to its burdens.

Nevertheless, the crew workmen and technicians have solved all of these problems, such as in the case of damage to radio communications in hurricanes. When the communications were paralyzed in certain sections, with true ingenuity the men of the wharf stepped in and improvised in their usual efficient manner.

During these aforementioned hurricanes, when radio towers were "out" at Bay Gardene, Grand Isle and other points the Wharf established temporary towers and relay stations between New Orleans, Grand Isle, Venice and other critical points.

These relay stations were in the form of units in the car of Game Agents at 15-mile intervals, and invaluable communications were kept up all during the storms and proved indispensable in the preservation of life and property. Nobody got any medals or pats on the back, the men of the Wharf simply carried on their operations in the same calm and efficient manner as they have exhibited in other emergencies.



This photograph shows Claude LeBlanc, superintendent of the wharf, overseeing installation of a motor in a pirogue. Commission personnel handle everything from sea-going craft for work in the gulf to small boats and motors used in shallow bodies of water and inland lakes and streams.



Communications are the nerve center of the highly mobile Louisiana Wild Life and Fisheries Commission. The big transmitter at the wharf operates on a 24-hour day. It relays messages and is in constant touch with district offices and outlying facilities such as the Marine Research Laboratory at Grand Terre and others. During Hurricane Betsy, it was the first communications link with those parishes in southcentral and southeast Louisiana which were so badly hit by the storm.

With the aid of its 25-ton crane the Wharf has effected 64 major "haulouts". Also, during this period, it has made 120 general overhauls on boats with motors of from 115 to 290 horsepower, and effected general repairs to 175 outboard motors and 250 general motor tuneups. After one



The radio repair shop at the wharf is at work constantly, repairing mobile two-way radios which are used in boats, automobiles, pick-up trucks, Commission planes and in offices of the Commission throughout the state.



The wharf maintenance crew even maintains the trailers which are used by wildlife agents in the field to move boats from one location to another. Here, a worker paints a trailer that has been re-conditioned. Top maintenance cuts operational costs and keeps Commission equipment in excellent shape.

of the storms, when the facilities of the wharf were deprived of electricity, mechanics at the wharf rigged up a temporary electrical system operating of a welding machine and kept things going until new equipment could be installed one and one-half week later.

The "Wharf" operates with a crew of 22 who are on hand to do anything from a minor engine

adjustment to a major "haul-out" and hull repair.

The addition of the stiffleg derrick has meant that craft up to fifty feet in length can be lifted for repairs. The boats are simply hoisted onto the docks, shorn up, and the workmen are able to begin their job with the "Wharf's" workshop facilities right at hand. This is a saving in time and labor.

Many pieces of equipment in need of servicing are brought in to the "Wharf". However, when it is less expensive, crews are sent out to effect repairs anywhere in the state. One of the best examples of this is the completely equipped radio repair van which conducts statewide, on-the-spot, repairs.

Currently a 170-foot radio tower is in operation at the wharf. This makes for better communications and a clearer range of statewide transmission and reception. Remote control through the main office makes it possible to have constant communication with boats, planes and mobile units, throughout the state.

Purchasing for the field such as marine supplies for boats, radios, etc., is handled through the wharf. Other facilities at the wharf include an outboard motor shop which keeps 300 outboard motors in tip-top shape throughout the year and a radio repair shop which services an equal number of radios. Also there is a fully equipped carpenter shop and marine repair shop. Along with this a warehouse for stock parts and materials is maintained.

Superintendent of the wharf is Claude LeBlanc who has a background of many years of experience with the Commission and previously, while with the U. S. Army, in repair and maintenance, was known for his "trouble shooting" when things needed straightening out.



The Commission's wharf and boat and radio maintenance shops are located at West End in New Orleans just across from the New Orleans Municipal Harbor. In this photograph the heavy duty hoist can be seen jutting up from the dock. It is here that Commission boats and motors are repaired and reconditioned, providing Commission personnel with dependable water transportation so vital in carrying out enforcement work.

Accounting Section

The Accounting Section is responsible for receipt, collection and accounting for all funds and income of the Wild Life Commission, the proper disbursing and recording of all expenditures of the commission and the preparation of such financial and budgetary reports as are necessary or desired.

More than \$16,000,000 annually is received and must be accounted for by Fund and by type of revenue. Receipts range from the few pennies of postage stamps sent in by a trapper as tax on a fur or two taken in traps to the large sums received as mineral lease payments. Expenditures are coded by Fund and kind of expenditure. The Accounting Department maintains all salary records and makes all payroll payments. It processes and makes all checks for the expenditures of the commission.

It maintains the motorboat registration for the State of Louisiana, with more than 70,000 current registrations in file. This program increases annually due to the popularity of the outboard motor boat. Renewal notices are sent out quarterly to approximately 15,000 registered owners for re-registration, and are processed on their return.

All of the operations of the Section are adapted to and are maintained on I.B.M. punch cards and printed data. The I.B.M. machine makes it possible to classify income and expense in detail. Records kept in this fashion deliver information quickly and easily for good budget control and for preparation of statements vital to management. The motorboat registration program depends on the use of I.B.M. machines for its very functioning.

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LAWRENCE H. COOK
Chief Accountant



GEORGE HEINTZEN
Accountant



ROGER HUNTER
Accountant

The Accounting Section includes a Purchasing Unit for items which can be bought directly under current purchasing directives. This Section also handles all purchases which are made through the Division of Administration.

Except for \$37,024 received from the General Fund for Civil Service salary adjustments in the fiscal year 1964/1965, all appropriations for the two year period treated in this report have been

made from the Conservation Fund, Federal funds and from the dedicated Funds.

The following statements reflect the financial operation of the Commission during the period covered by this Biennial Report. The accounting records from which these reports are drawn are regularly audited by the Legislative Auditor, the Division of Administration, the Louisiana Civil Service and several Federal Agencies.

Exhibit 1
LOUISIANA WILD LIFE AND FISHERIES COMMISSION
BALANCE SHEET
June 30, 1965

	<i>ASSETS</i>			<i>LIABILITIES</i>		
	<i>Cash</i>	<i>Accounts Receivable</i>	<i>Total Assets</i>	<i>Accounts Payable</i>	<i>Surplus</i>	<i>Total Liabilities & Surplus</i>
Conservation Fund.....	\$ 509,555.54	\$104,092.26	\$ 613,647.68	\$ 562,661.75	\$ 50,935.93	\$ 613,647.68
Rockefeller Fund.....	516,917.38	.....	516,917.38	430,814.75	86,102.64	516,917.38
Oyster Seed Ground Fund.....	548,774.40	.....	548,774.40	548,774.40	.....	548,774.40
Commercial Seafood Fund.....	579,922.09	.....	579,922.09	579,922.09	.....	579,922.09
Marsh Island Fund.....	313,883.19	.....	313,883.19	313,883.19	.....	313,883.19
Seismic Fund.....	283,833.44	43,789.00	327,622.44	.....	327,622.44	327,622.44
Bodeau Game-Mgm. Fund.....	1,804.50	.....	1,804.50	.....	1,804.50	1,804.50
Boat Ramp Fund.....	199,389.38	.....	199,389.38	.....	199,389.38	199,389.38
TOTAL.....	\$2,954,079.92	\$147,881.26	\$3,101,961.06	\$2,436,056.17	\$665,904.89	\$3,101,961.06



This is a view of one section of the Accounting Section which handles the bulk of the Commission's paper work. Staff personnel handle the payment of bills, the sale and auditing of hunting, fishing, trawling and trapping licenses. The payroll records are kept here and the purchasing of necessary equipment is handled by the Accounting Section.

Exhibit 2
APPROPRIATIONS

	<i>1963-64</i> <i>Actual</i>	<i>1964-65</i> <i>Actual</i>	<i>1965-66</i> <i>Budget</i>
CONSERVATION FUND:	\$3,430,873.00	\$3,200,336.00	\$3,358,789.00
FEDERAL FUNDS:			
Pittman-Robertson.....	331,242.83	292,245.86	260,000.00
Dingell-Johnson.....	30,637.81	48,509.90	40,000.00
Hyacinth Control.....	106,072.83	124,333.30	100,000.00
Water Pollution.....	74,501.70	75,202.92	70,000.00
DEDICATED FUNDS:			
Rockefeller.....	1,002,000.00	826,388.00	905,695.00
Oyster Seed Grounds.....	350,000.00	419,972.00	445,681.00
Commercial Seafood.....	400,000.00	408,609.00	355,302.00
Marsh Island.....	220,000.00	246,888.00	397,145.00
GENERAL FUND: .....	.....	37,024.00	.....
TOTAL.....	\$5,945,328.17	\$5,679,508.98	\$5,932,612.00

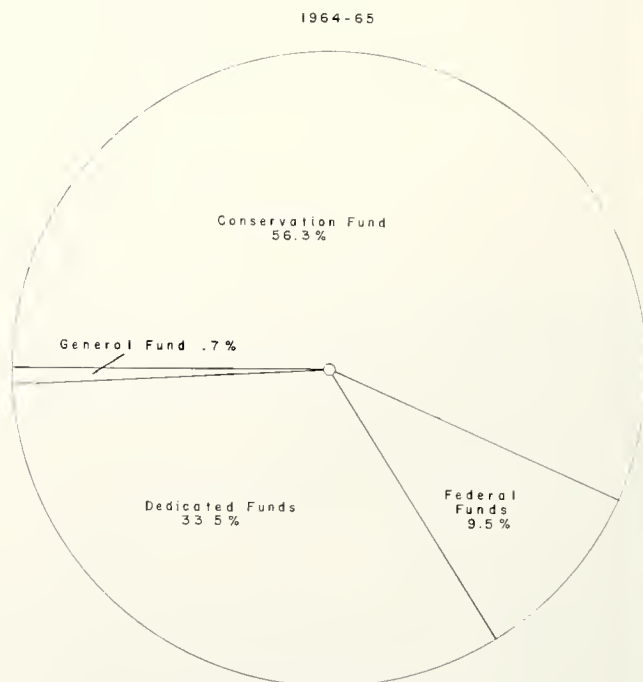
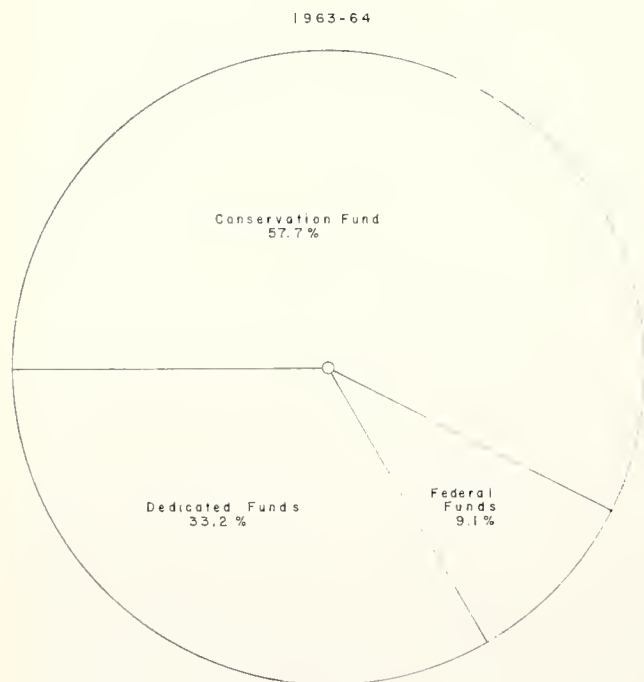
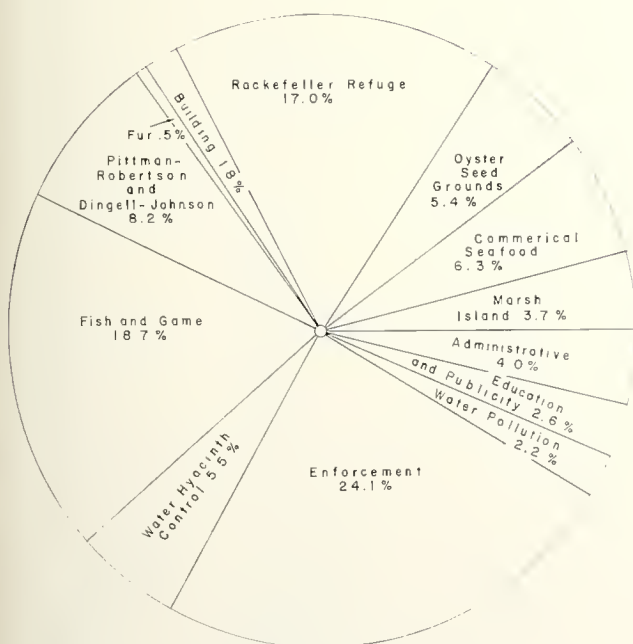


Exhibit 3
EXPENDITURES AND BUDGET
BY FUNDS AND DIVISIONS

	1963-64 Actual	1964-65 Actual	1965-66 Budget
Administrative.....	\$ 238,160.77	\$ 233,650.58	\$ 245,482.00
Education & Publicity.....	150,868.64	135,882.66	165,941.00
Water Pollution Control.....	131,090.70	148,545.73	144,217.00
Enforcement.....	1,414,413.23	1,548,147.17	1,582,351.00
Water Hyacinth Control.....	320,762.79	305,921.51	293,800.00
Fish and Game.....	1,098,214.19	726,380.76	1,240,968.00
Pittman-Robertson.....	442,323.79	405,114.26	*
Dingell-Johnson.....	41,736.50	52,334.08	*
Fur.....	27,914.77	27,527.53	34,861.00
Ward McIlhenny.....	.....	10,830.08	2,075.00
Building.....	107,045.17	109,862.69	119,194.00
Total Conservation Fund:	3,972,530.55	3,704,197.05	3,828,889.00
Rockefeller Refuge Fund.....	999,368.04	652,571.84	905,695.00
Oyster Seed Grounds Fund.....	319,516.85	370,901.83	395,681.00
Commercial Seafood Fund.....	369,977.14	321,974.94	405,202.00
Marsh Island Fund.....	219,494.93	159,372.63	397,145.00
TOTAL	\$5,880,887.51	\$5,209,018.29	\$5,932,612.00

*Included in Fish & Game Budget.

1963-64



1964-65

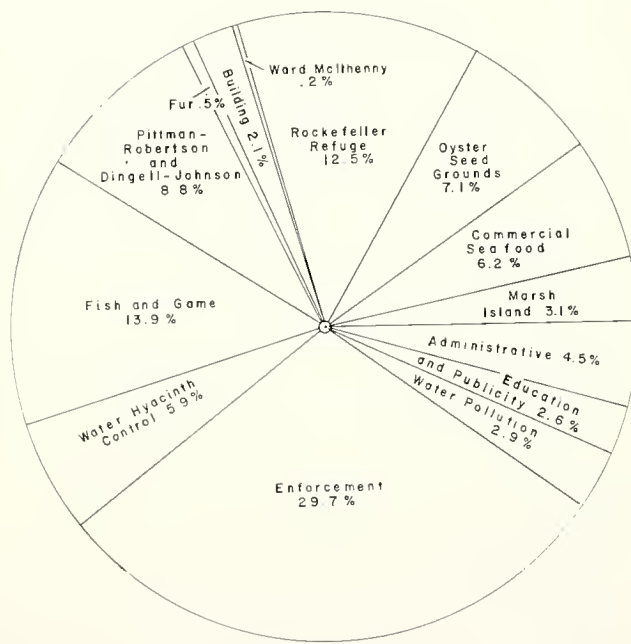


Exhibit 4

**ALL RECEIPTS
CONSERVATION FUND—DEDICATED FUNDS AND FEDERAL FUNDS
ACTUAL RECEIPTS 1963-64 AND 1964-65—ESTIMATED RECEIPTS 1965-66**

CONSERVATION FUND	Actual 1963-64	Actual 1964-65	Estimated 1965-66
Sport Licenses:			
Fishing—New Orleans.....	\$ 30,090.00	\$ 38,517.00	\$ 80,000.00*
Fishing—Other Parishes.....	205,754.92	195,111.06	400,000.00*
Total Fishing.....	\$ 235,844.92	\$ 233,628.06	\$ 480,000.00
Hunting—New Orleans.....	\$ 28,890.00	\$ 32,671.00	\$ 35,000.00
Hunting—Other Parishes.....	632,509.80	640,943.02	650,000.00
Total Hunting.....	\$ 661,399.80	\$ 673,614.02	\$ 685,000.00
Total Sport Licenses.....	\$ 897,244.72	\$ 907,242.08	\$ 1,165,000.00
Commercial Fishing and Dealers: (Including Fish Shrimp and Oyster)			
Commercial Fisherman—Bait Seller.....	\$ 3,630.00	\$ 3,265.00	\$ 3,300.00
Hoop Net.....	8,660.00	9,435.00	9,500.00
Fresh Water Seine.....	1,710.00	1,775.00	1,800.00
Fresh Water Trammel Net.....	6,095.00	6,560.00	6,600.00
Fresh Water Gill Net.....	21,290.00	21,310.00	21,500.00
Salt Water Fish and Shrimp Seine.....	1,110.00	1,060.00	1,000.00
Salt Water Trammel Net.....	1,500.00	1,645.00	1,700.00
Salt Water Menhaden Seine and Vessel.....	6,500.00	8,100.00	8,500.00
Oyster Vessel Tonnage.....	2,489.00	2,012.00	2,000.00
Oyster Dredging.....	10,850.00	10,750.00	10,800.00
Salt Water Fish Vessel.....	280.00	350.00	400.00
Salt Water Shrimp Trawl and Vessel.....	158,220.00	153,255.00	155,000.00
Salt Water Shrimp Freight.....	20.00	5.00	.....
Oyster Bedding Ground.....	85,028.00	88,478.00	90,000.00
Oyster Shop and Resale.....	1,165.00	1,530.00	1,800.00
Wholesale Dealer.....	11,550.00	16,850.00	17,000.00
Wholesale Dealer's Agent.....	610.00	720.00	800.00
Retail Dealer.....	14,405.00	17,495.00	18,000.00
Non-Resident Minnow Dealer.....	400.00	600.00	600.00
Fish Farmer.....	.....	70.00	100.00
Total Commercial Fishing and Dealers.....	\$ 335,512.00	\$ 345,265.00	\$ 350,400.00
Severance Tax:			
Gravel.....	\$ 6,200.98	\$ 13,061.23	\$ 15,000.00
Sand.....	9,622.04	8,432.85	9,000.00
Fill Material.....	85,375.02	101,190.04	110,000.00
Fur.....	30,737.94	24,447.96	25,000.00
Oyster.....	15,129.04	11,145.60	12,000.00
Shrimp.....	63,456.64	44,627.62	50,000.00
Total Severance Tax.....	\$ 210,521.66	\$ 202,905.30	\$ 221,000.00
Miscellaneous Licenses and Receipts:			
Hunting Club.....	\$ 1,595.00	\$ 1,740.00	\$ 1,800.00
Hunting Preserve.....	1,400.00	1,000.00	1,000.00
Game Breeder.....	1,260.00	1,410.00	1,500.00
Transfer of Oyster Lease.....	28.00	49.00	50.00
Resident Fur Buyer.....	3,425.00	3,000.00	3,000.00
Resident Fur Dealer.....	2,550.00	1,950.00	2,100.00
Non-Resident Fur Dealer.....	1,200.00	1,200.00	1,200.00
Trapper—New Orleans.....	358.00	578.00	600.00
Trapper—Other Parishes.....	5,177.08	4,913.21	5,000.00
Miscellaneous.....	1,181.20	2,416.60	2,000.00
Total Miscellaneous Licenses and Receipts.....	\$ 18,174.28	\$ 18,256.81	\$ 18,250.00
Motorboat Registration.....	\$ 132,658.25	\$ 81,696.75	\$ 90,000.00
Building Rental.....	\$ 139,164.79	\$ 143,092.03	\$ 145,000.00
Royalties From Mineral Leases:			
Oil and Gas.....	\$2,142,026.34	\$ 2,753,744.96	\$ 2,800,000.00
Sulphur.....	274,621.50	425,202.57	475,000.00
Salt.....	.....	1,291.98	2,000.00
Bonuses.....	5,909.40	384,292.99	50,000.00
Total Royalties From Mineral Leases.....	\$2,422,557.24	\$ 3,564,532.50	\$ 3,327,000.00
TOTAL CONSERVATION FUND RECEIPTS.....	\$4,155,832.94	\$ 5,262,990.47	\$ 5,316,650.00

Exhibit 4 (Continued)

**ALL RECEIPTS
CONSERVATION FUND—DEDICATED FUNDS AND FEDERAL FUNDS
ACTUAL RECEIPTS 1963-64 AND 1964-65—ESTIMATED RECEIPTS 1965-66**

DEDICATED FUNDS	<i>Actual 1963-64</i>	<i>Actual 1964-65</i>	<i>Estimated 1965-66</i>
Oyster Seed Ground:			
Shell Severance Tax.....	\$ 412,896.94	\$ 543,559.50	\$ 550,000.00
Survey Fees.....	14,615.75	12,627.25	15,000.00
Rebedding Fees.....	6,445.65	3,810.32	5,000.00
Interest.....		789.19	
Total Oyster Seed Ground.....	\$ 433,958.34	\$ 560,786.26	\$ 570,000.00
Commercial Seafood:			
Shell Severance Tax.....	\$ 412,896.94	\$ 543,559.52	\$ 550,000.00
Sale of Equipment.....	4,528.58		
Interest.....		789.19	
Total Commercial Seafood.....	\$ 417,425.52	\$ 544,348.71	\$ 550,000.00
Rockefeller Refuge:			
Royalties from Mineral Leases.....	\$2,457,299.65	\$ 3,123,559.58	\$ 3,125,000.00
Fur Sales.....	214.10	162.00	200.00
Interest.....		263.06	
Total Rockefeller Refuge.....	\$2,457,513.75	\$ 3,123,984.64	\$ 3,125,200.00
Marsh Island Refuge:			
Royalties From Mineral Leases.....	\$ 154,742.64	\$ 153,926.92	\$ 155,000.00
Pass-a-Loutre Hunting Permits.....	2,955.00	3,935.00	4,000.00
Pasturage.....	225.00	225.00	225.00
Fur Sales.....	162.00	101.70	175.00
Sale of Material.....		189.00	
Interest.....		263.06	
Total Marsh Island Refuge.....	\$ 158,084.64	\$ 158,640.68	\$ 159,400.00
TOTAL DEDICATED FUNDS.....	\$3,466,982.25	\$ 4,387,760.29	\$ 4,404,600.00
FEDERAL FUNDS			
Pittman-Robertson.....	\$ 330,287.03**	\$ 292,245.66**	\$ 260,000.00
Dingell-Johnson.....	30,637.81	48,510.10**	40,000.00
Hyacinth Control.....	107,557.71	125,562.49	100,000.00
Water Pollution Control.....	74,501.70	75,202.92	70,000.00
Total Federal Funds.....	\$ 542,984.25	\$ 541,521.17	\$ 470,000.00
GRAND TOTAL ALL RECEIPTS.....	\$8,165,799.44	\$10,192,271.93	\$10,191,250.00

*Sport Fishing licenses were increased from \$1.00 to \$2.00 beginning 1965 (License good for two year period 1965-67)

**Includes Receivables-Subject to Revision.

Exhibit 5

FUNDS, DIVISIONS AND MAJOR EXPENSE CLASSIFICATION—1963-1964

	Personal Services	Contractual Services	Travel	Material & Supplies	Retirement S/S Hospitaliz.	Equipment	Major Repairs	Construction	Credits	Total	%
Administration	\$ 273,681.10	\$100,304.04	\$ 7,824.35	\$ 46,857.25	\$ 27,119.23	\$ 8,174.80	\$.....	\$.....	(\$225,800.00)	\$ 238,160.77	4.1
Education & Publicity	41,764.25	97,945.50	1,138.50	6,033.95	3,583.65	402.79	.....	.....	.....	150,868.64	2.7
Water Pollution	86,633.09	10,071.22	7,693.85	15,902.81	7,617.06	3,172.67	.....	.....	.....	131,090.70	2.3
Enforcement	916,467.04	72,907.29	.....	150,085.35	121,012.60	82,935.50	61,605.45	9,400.00	.....	1,414,413.23	24.6
Hyacinth	211,383.44	23,448.79	8,800.41	45,021.96	19,874.21	12,233.98	.....	.....	.....	320,762.79	5.4
Fish & Game	557,728.44	128,419.35	39,041.14	172,920.35	50,164.12	122,264.08	.....	511,737.00	.....	1,582,274.48	27.9
Fur	19,716.60	1,517.95	759.20	1,781.99	1,508.46	2,630.57	.....	.....	.....	27,914.77	.4
Building	57,500.16	31,705.15	.....	14,329.92	3,509.94	.....	.....	.....	.....	107,045.17	1.8
Rockefeller	182,294.25	86,584.64	8,762.02	128,672.51	16,980.17	162,127.98	37,246.47	376,700.00	.....	999,368.04	15.6
Oyster	141,760.64	45,160.36	11,178.23	72,328.50	12,723.24	21,382.03	14,983.85	.....	.....	319,516.85	5.3
Commercial Seafood	146,138.82	50,504.02	20,162.07	43,303.70	12,587.92	28,977.74	.....	68,302.87	.....	369,977.14	6.2
Marsh Island	58,522.53	19,876.77	627.45	33,572.79	5,717.28	3,639.31	1,324.12	96,214.68	.....	219,494.93	3.7
TOTAL	\$2,693,590.36	\$668,445.08	\$256,072.57	\$701,738.33	\$244,320.78	\$426,611.40	\$62,954.44	\$1,052,954.55	(\$225,800.00)	\$5,880,887.51	100.0%
	43.7	11.2	4.4	11.8	4.2	7.2	1.0	17.7	(3.8)		100.0%

Exhibit 6

FUNDS, DIVISIONS AND MAJOR EXPENSE CLASSIFICATION—1964-1965

	Personal Services	Contractual Services	Travel	Materials & Supplies	Retirement S/S Hospitaliz.	Equipment	Major Repairs	Credits	Total	%
Administration	\$ 280,044.84	\$ 74,018.32	\$ 12,390.24	\$ 55,927.36	\$ 23,403.15	\$ 13,666.67	\$.....	(\$225,800.00)	\$ 233,650.58	4.4
Education & Publicity	48,927.23	68,353.32	1,687.87	9,702.36	4,303.36	2,908.52	.....	.....	135,882.66	2.6
Water Pollution	91,118.12	13,374.07	7,041.45	17,111.64	8,447.04	6,211.51	4,941.90	.....	148,545.73	2.8
Enforcement	1,009,049.82	97,925.40	142,414.82	146,706.08	95,175.75	44,310.27	12,565.03	.....	1,548,147.17	29.7
Hyacinth	225,269.59	22,968.81	6,148.49	21,428.78	20,362.65	9,743.19	.....	.....	305,921.51	5.9
Fish & Game	646,352.03	151,534.34	47,861.80	192,285.73	59,137.58	85,557.62	1,100.00	.....	1,183,829.10	23.1
Fur	20,053.33	2,280.19	1,881.90	1,585.30	1,726.81	.....	.....	.....	27,527.53	.5
Ward McIlhenny	10,666.00	60.18	74.39	29.51	.....	.....	.....	.....	10,830.08	.2
Building	61,847.03	36,404.01	.....	7,818.76	3,792.89	.....	.....	.....	109,862.69	2.1
Rockefeller	195,504.22	125,552.07	8,025.45	175,032.45	18,713.60	69,489.84	60,254.21	.....	652,571.84	12.5
Oyster Seed Grounds	161,608.43	44,698.59	13,739.16	83,792.99	14,509.20	44,527.26	8,026.20	.....	370,901.83	7.1
Commercial Seafood	154,340.53	49,848.87	21,902.11	53,950.89	13,741.08	26,304.20	1,887.26	.....	321,974.94	6.1
Marsh Island	65,328.16	21,661.87	709.65	43,023.59	6,416.32	14,842.86	7,390.18	.....	159,372.63	3.0
TOTAL	\$2,970,109.33	\$708,680.04	\$263,877.33	\$808,695.44	\$269,729.43	\$317,561.94	\$96,164.78	(\$225,800.00)	\$5,209,018.29	100.0%
Percentage	57.0	13.6	5.0	15.5	5.1	6.1	1.8	(4.1)		100.0%

Exhibit 7
BUDGET
FUNDS, DIVISIONS AND MAJOR EXPENSE CLASSIFICATION—1965-1966

	Personal Services	Contractual Services	Travel	Materials & Supplies	Retirement S/S Hospitaliz.	Equip- ment	Major Repairs	Credits	Non- Recurring	Total	%
Administrative	\$ 290,366.00	\$ 60,356.00	\$ 12,000.00	\$ 48,962.00	\$ 48,458.00	\$ 11,140.00	\$	(\$225,800.00)	\$	\$ 245,482.00	4.1
Education & Publicity	55,805.00	85,964.00	1,000.00	6,794.00	5,085.00	6,293.00	.....	.....	.....	165,941.00	2.7
Water Pollution	96,745.00	11,078.00	7,000.00	12,800.00	9,006.00	7,588.00	.....	.....	.....	144,217.00	2.4
Enforcement	1,052,910.00	75,682.00	166,000.00	100,073.00	95,875.00	84,311.00	7,500.00	.....	.....	1,582,351.00	26.6
Water Hyacinth	214,225.00	24,919.00	5,000.00	28,731.00	19,970.00	5,955.00	.....	.....	.....	293,800.00	4.9
Fish & Game	704,021.00	129,484.00	49,044.00	133,514.00	64,219.00	140,186.00	20,500.00	.....	.....	1,240,968.00	20.8
Fur	21,315.00	2,802.00	1,000.00	2,000.00	1,948.00	599.00	5,200.00	.....	.....	34,861.00	.5
Ward McIlhenny .....	.....	50.00	2,000.00	25.00	.....	.....	.....	.....	.....	2,075.00	.3
Building	68,460.00	35,000.00	.....	9,545.00	5,889.00	300.00	.....	.....	.....	119,194.00	2.6
Rockefeller	227,550.00	121,325.00	10,500.00	123,395.00	24,250.00	211,675.00	187,000.00	.....	.....	905,695.00	15.2
Oyster Seed Grounds	193,578.00	51,265.00	12,000.00	82,190.00	18,529.00	24,519.00	13,600.00	.....	.....	395,681.00	6.5
Commercial Seafood	163,005.00	52,835.00	20,100.00	51,391.00	16,451.00	34,420.00	17,000.00	.....	.....	405,202.00	6.8
Marsh Island	72,930.00	23,425.00	2,800.00	26,235.00	7,855.00	54,900.00	209,000.00	.....	.....	397,145.00	6.6
TOTAL	\$3,160,910.00	\$674,185.00	\$288,444.00	\$625,655.00	\$317,535.00	\$581,833.00	\$459,800.00	(\$225,800.00)	\$50,000.00	\$5,932,612.00	100.0%
Percentage	53.4	11.4	4.9	10.6	5.4	9.8	7.8	(3.8)	.5		100.0%

Exhibit 8
OTHER EXPENDITURES

	1963-64	1964-65
SEISMIC FUND		
Balance as of July 1	\$380,852.00	\$337,904.75
RECEIPTS	347,011.40	394,894.25
EXPENDITURES		
Personal Services	269,843.83	209,366.56
Travel	70,241.10	81,553.77
Contractual Services	30,459.71	30,276.47
Ret.-Hosp. & Social Security	19,414.11	22,948.06
Balance as of June 30	\$337,904.75	\$288,654.14
WARD MCILHENNY		
Balance as of July 1	\$ 3,861.55	\$ 104.79
RECEIPTS	38,000.00	.....
EXPENDITURES		
Personal Services	41,300.00	.....
Travel	126.59	.....
Contractual Services	330.14	.....
Surplus Refund to State Treasurer .....	.....	104.79
Balance as of June 30	\$ 104.79	\$
BODCAU GAME MANAGEMENT AREA		
Balance as of July 1	\$	\$ 1,804.50
RECEIPTS	2,010.97	2,010.97
EXPENDITURES		
Material & Supplies	206.47	206.47
Equipment .....	.....	1,554.52
Balance as of June 30	\$ 1,804.50	\$ 5,095.95
DUCKS UNLIMITED		
Balance as of July 1	\$	\$
RECEIPTS	69,650.50	69,650.50
EXPENDITURES		
Contractual Services	69,650.50	69,650.50
Balance as of June 30	\$	\$
APW BOAT RAMPS		
Balance as of July 1	\$	\$199,389.38
RECEIPTS	396,509.94	254,323.45
EXPENDITURES		
Contractual Service	2,543.70	9,622.17
Construction	194,576.86	264,887.66
Balance as of June 30	\$199,389.38	\$179,203.00

Exhibit 9
LOUISIANA SHRIMP PRODUCTION BY SIZE

Size (heads-off per pound) Number	1964			1963		
	Quantity 1000 lbs.	Percent of Total %	Value to Fishermen Cents	Quantity 1000 lbs.	Percent of Total %	Value to Fishermen Cents
Under 15	827.4	2.2	87.0	259.2	0.5	86.3
15 - 20	4,361.1	11.5	82.3	2,602.2	5.0	89.1
21 - 25	3,260.9	8.6	73.6	3,409.8	6.6	70.6
26 - 30	2,634.7	6.9	63.9	4,080.4	7.9	57.2
31 - 40	6,639.8	17.4	52.3	9,660.6	18.7	47.7
41 - 50	4,171.0	10.9	44.1	5,830.2	11.3	39.6
51 - 67	6,774.0	17.8	36.8	10,209.2	19.8	26.4
68 & Over	9,145.3	24.0	27.6	14,961.0	28.9	18.8
Sea Bobs	280.8	0.7	22.6	689.6	1.3	09.2
TOTAL	38,095.0	100.0	49.3	51,702.2	100.0	38.3

Exhibit 10
**SHRIMP PRODUCTION AND NUMBER
OF TRAWLS AND/OR SEINES—1913-1964**

Calendar Year	Barrels Shrimp (210 lbs.)	No. of Seines	No. of Trawls
1913.....	50,000	131	....
1914.....	52,381	131	....
1915.....	57,143	268	....
1916.....	85,714	...	....
1917.....	57,143	...	....
1918.....	71,429	300	17
1919.....	76,190	...	....
1920.....	152,381	97	499
1921.....	163,012	135	983
1922.....	109,050	111	699
1923.....	153,749	128	1,021
1924.....	150,624	143	905
1925.....	154,722	180	1,010
1926.....	123,967	143	692
1927.....	150,896	120	913
1928.....	195,303	261	1,454
1929.....	210,033	125	1,486
1930.....	197,550	172	1,176
1931.....	178,815	126	1,131
1932.....	152,373	66	699
1933.....	166,058	67	1,045
1934.....	226,576	107	1,441
1935.....	252,981	125	1,433
1936.....	286,749	30	1,920
1937.....	362,942	35	2,313
1938.....	363,656	13	1,662
1939.....	395,050	26	1,621
1940.....	397,189	5	3,016
1941.....	554,354	5	3,028
1942.....	489,173	4	2,380
1943.....	441,445	4	2,101
1944.....	544,378	4	1,866
1945.....	495,994	4	2,373
1946.....	464,981	4	3,030
1947.....	365,617	4	3,408
1948.....	376,605	4	3,200
1949.....	376,040	4	3,310
1950.....	361,365	3	2,819
1951.....	396,980	0	2,248
1952.....	398,952	0	2,277
1953.....	437,340	10	3,543
1954.....	451,647	4	3,442
1955.....	365,542	5	3,276
1956.....	318,130	7	3,072
1957.....	181,061	9	2,419
1958.....	208,586	9	4,400
1959.....	254,438	8	4,154
1960.....	306,774	7	4,896
1961.....	148,423	8	4,577
1962.....	208,920	...	5,453
1963.....	384,828	...	7,025
1964.....	282,852	...	7,397

Exhibit 11

**COMPARATIVE STATEMENT OF FRESH AND SALT WATER COMMERCIAL FISH
PRODUCED BY LOUISIANA FISHERMEN**

	1964		1963	
FRESH WATER FISHERIES	<i>Pounds</i>	<i>Value to Fishermen</i>	<i>Pounds</i>	<i>Value to Fishermen</i>
Bowfin.....	77,400	\$ 3,213	59,500	\$ 2,650
Buffalofish.....	3,308,400	336,699	3,487,600	398,736
Carp.....	169,300	6,241	208,900	8,595
Catfish & Bullheads.....	7,807,800	1,802,275	8,665,300	1,766,646
Garfish.....	1,377,500	67,059	1,155,900	59,086
Paddlefish (Spoonbill).....	23,700	1,508	34,100	1,955
Sheepshead (Gaspargou).....	653,000	63,964	1,000,300	94,749
Crawfish.....	3,326,700	568,493	2,118,400	300,126
Baby Green Turtles ..	15,200	60,800	22,000	88,000
Fresh Water Turtles.....	120,200	20,719	163,500	20,772
Frogs.....	65,000	23,396	59,500	22,686
Total Fresh Water Fisheries.....	16,944,200	\$ 2,954,367	16,975,000	\$ 2,764,001
SALT WATER FISHERIES				
Cobia.....	300	30	6,800	345
Croaker.....	20,500	1,025	24,900	1,558
Drum:				
Black.....	306,500	22,798	343,600	22,221
Red (Red Fish).....	311,700	50,199	465,600	79,035
Flounder.....	190,100	24,670	162,200	25,502
Grouper.....	12,700	913	23,400	2,040
Jewfish.....	2,200	53	8,300	698
King Whiting (Black Mullet).....	472,000	26,576	371,800	18,536
Menhaden.....	599,537,500	9,045,557	633,484,300	7,861,871
Mullet (Popeye).....	22,200	1,087	18,900	715
Pompano.....	9,300	6,000	1,100	710
Sawfish.....	3,600	180	4,300	187
Sea Catfish.....	60,200	3,185	58,900	3,180
Sea Trout or Weakfish:				
Spotted.....	290,500	68,130	380,400	88,020
White.....	66,100	5,065	79,600	6,121
Shark.....	2,700	125	3,900	176
Sheepshead.....	138,300	11,234	177,100	13,350
Snapper, Red.....	309,900	78,245	387,900	95,202
Spanish Mackerel.....	1,500	191	1,900	170
Spot.....	5,500	300	7,500	495
Tripletail.....	2,600	181	2,800	150
Warsaw.....	4,300	427	5,000	480
Miscellaneous.....	8,166,300	101,617	6,970,800	87,400
Crabs:				
Hard.....	5,691,700	379,214	7,981,900	447,096
Soft & Peeler.....	199,900	126,940	328,700	164,350
Shrimp	59,399,100	18,797,662	80,814,000	19,790,676
Sea Turtles.....	3,000	420	2,200	223
Total Salt Water Fisheries.....	675,230,200	\$28,752,024	732,117,800	\$28,710,507
GRAND TOTAL.....	692,174,400	\$31,704,391	749,092,800	\$31,474,508

Fish production figures presented were obtained in cooperation with U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries.

Exhibit 12
1964 COMMERCIAL FISHING AND DEALERS
LICENSES SOLD BY PARISH, STATE AND CLASS

Parish	S.W. Shrimp Trawl & Vessel	S. W. Fish Vessel	Menhaden & Vessel	Oyster Tonnage	Oyster Dredging	Oyster Shop—Resale	Commercial Fisherman & Boat	Hoop Net	F. W. Seine	F. W. Trawl Net	F. W. Gill Net	S. W. Seine	S. W. Trawl Net	Retail Dealer	Wholesale Dealer	Wholesale Agent	Total Licenses Sold	Total Revenue
Acadia	103			2			10	23	36	6	82	5	3	47	2	2	321	3,122
Allen	9						7	27	4	6	8			23			84	570
Ascension	4						6	5		1	10	1		43		2	77	735
Assumption	14						1	46	2	1	11			23		4	112	1,460
Avoyelles							7	35	4	17	74			34			174	1,750
Beauregard	8						20	35	1	1	32			29			127	845
Bienville							13	6	1	6	20			22			68	550
Bossier	1			1			6	9	3	10	53			158			133	980
Caddo							32	27	6	16	98			15			346	2,496
Calcasieu	715			31			33	78	47	8	222	11	8	114			1286	17,222
Caldwell				370		6	2	22	2	12	42	10		15			95	640
Cameron	191		8				19	2	2	1	25		1	18			655	5,975
Catahoula							12	40	12	26	43			17		3	159	1,640
Claiborne							8	2		17	4			15			21	115
Concordia								14	2	3	36			14			91	840
DeSoto							8	21	1	3	24			21			78	445
E. Baton Rouge	25					2	13	59		18	34			190			349	2,520
E. Carroll							5	14	8	16	66			20			131	1,045
E. Feliciana								49	19	4	7			7			23	125
Evangeline	18	1					9	30	5	29	69	1		71			266	1,605
Franklin							6	13	2	64	96			19			223	1,875
Grant							10	20		7	42			16			88	645
Iberia	240	1					9	108	2		21	15	3	70			383	5,745
Iberville	4						5	4	3	8	23			26		3	188	1,780
Jackson							4	4		4	13			32			57	310
Jefferson	768	4			8		18	11		3	12	3	13	152	32	3	1070	20,028
Jefferson Davis	169	1		21			5	43	1	8	45	2	1	32	1		333	4,227
Lafayette	146	1		6		2	9	4	24	4	15		1	101	3		304	3,447
Lafourche	549			78	29	3	5	7	4	1	9	1	2	42	14	4	748	15,747
LaSalle							10	37	4	26	26			25	2	3	133	1,105
Lincoln							5	3		6	25			33			72	385
Livingston	1						10	23		7	12			13	1		67	510
Madison							3	17		22	34			16			93	605
Morehouse							11	37	5	42	57			52			204	1,215
Natchitoches	1						13	17	1	13	92			20			157	1,525
Orleans	304	2	1	47	16	39	32	2	2	2	20	3	27	548	30		1,075	12,142
Ouachita					43	6	39	60	8	68	224		1	102	6		508	3,435
Plaquemines	432	1	14	101			2	10		9	3		20	24	4	1	670	13,447
Pointe Coupee							17	10	4	2	23			16			73	540
Rapides	3						21	45	5	44	101	1		112	5		337	2,190
Red River							4	15	1	4	16			4			44	320

Exhibit 12 (Continued)

Parish	S.W. Shrimp Travel & Vessel	S.W. Fish Vessel	Menhaden Seine & Vessel	Oyster Tonnage	Oyster Dredging	Oyster Shop—Resale	Commercial Fisherman & Bait	Hoop Net	F. W. Seine	F. W. Trammel Net	F. W. Gill Net	S. W. Seine	S. W. Trammel Net	Retail Dealer	Wholesale Dealer	Wholesale Agent	Total Licenses Sold	Total Revenue
Richland	1	..	..	..	..	..	8	20	4	36	82	..	..	29	2	..	181	1,140
Sabine	..	..	..	..	..	..	13	21	..	6	23	..	..	18	..	..	82	445
St. Bernard	241	..	..	31	20	3	4	2	..	1	6	1	3	32	8	..	352	6,707
St. Charles	71	..	..	..	..	1	2	4	..	1	3	..	..	28	3	8	122	1,790
St. Helena	..	..	..	..	..	..	..	3	..	..	..	..	..	3	..	..	6	30
St. James	11	..	..	..	..	..	..	1	..	..	2	..	..	21	2	1	38	425
St. John	13	..	..	..	..	..	..	..	..	1	3	..	..	16	..	..	33	395
St. Landry	28	..	..	..	..	..	29	48	35	49	105	5	..	66	5	1	371	2,865
St. Martin	12	..	..	..	..	..	12	46	2	9	26	..	1	34	15	4	161	1,880
St. Mary	493	8	9	2	..	3	21	74	6	29	49	9	..	73	13	12	801	14,913
St. Tammany	27	..	..	1	1	..	77	25	..	1	7	2	5	15	1	..	162	1,459
Tangipahoa	8	..	..	6	5	3	12	9	..	5	12	..	..	72	5	..	137	1,351
Texas	..	..	..	..	..	..	3	6	1	4	28	..	..	18	..	..	60	635
Terrebonne	1,370	2	5	50	19	14	4	4	..	4	5	6	21	49	59	14	1,626	34,664
Union	..	..	..	..	..	..	7	58	..	41	139	19	..	9	..	..	254	1,595
Vernilion	432	2	..	4	..	3	26	9	12	1	51	..	1	63	6	..	629	9,219
Vernon	..	..	..	..	..	..	11	11	..	1	13	..	..	8	..	..	45	240
Washington	1	..	..	..	..	..	11	21	..	3	13	..	..	24	..	..	73	420
Webster	..	..	..	..	..	..	7	24	..	23	97	..	..	56	..	..	207	1,375
W. Baton Rouge	1	..	..	..	..	..	4	8	..	2	10	1	..	6	1	..	33	255
W. Carroll	..	..	..	..	..	..	3	24	..	17	87	..	..	18	1	..	150	1,140
W. Feliciana	..	..	..	..	..	..	..	1	..	5	4	..	..	10	..	..	20	120
Winn	..	..	..	..	..	..	8	16	1	2	10	..	..	18	..	..	55	285
TOTAL LOUISIANA	6,415	30	47	753	141	106	711	1,469	295	783	2,644	96	111	3,072	282	66	17,021	\$219,251
Alabama	123	3	..	1	..	..	..	..	..	..	..	..	7	..	..	..	134	4,637
Florida	37	12	1	..	..	..	..	..	..	..	..	..	..	..	..	..	50	1,820
Mississippi	256	14	23	85	76	..	..	4	4	5	12	4	22	1	*1	..	507	15,073
Texas	566	2	4	15	..	..	5	3	..	..	7	5	4	3	*1	..	615	16,170
TOTAL NON-RES.	982	31	28	101	76	..	5	7	4	5	19	9	33	4	2	..	1,306	\$ 37,700
1964 Total	7,397	61	75	854	217	106	716	1,476	299	788	2,663	105	144	3,076	284	66	18,327	\$256,951
1963 Total	7,025	49	69	944	309	143	870	1,542	316	701	2,403	102	160	3,448	277	83	18,441	255,797
Increase	372	12	6	90	92	37	154	66	17	87	260	3	16	372	7	17	114	1,154
Decrease	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
% Increase	5.3	24.5	8.7	9.5	29.8	25.9	17.7	4.3	5.4	12.4	10.8	3.0	10.0	10.8	2.6	20.5	0.6	0.5
% Decrease	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

*Non-Resident wholesale minnow dealer.

Exhibit 13
1965 COMMERCIAL FISHING AND DEALERS
LICENSES SOLD BY PARISH, STATE AND CLASS

<i>Parish</i>	<i>S.W. Shrimp Trawl Vessel</i>	<i>S. W. Fish Vessel</i>	<i>Menhaden Seine & Vessel</i>	<i>Oyster Tonnage</i>	<i>Oyster Dredging</i>	<i>Shop—Resale Oyster</i>	<i>Commercial Fisherman & Boat</i>	<i>Hoop Net</i>	<i>F. W. Seine</i>	<i>F. W. Trawl Net</i>	<i>F. W. Gill Net</i>	<i>Fish Farmer</i>	<i>S. W. Seine</i>	<i>S. W. Trawl Net</i>	<i>Retail Dealer</i>	<i>Wholesale Dealer</i>	<i>Wholesale Agent</i>	<i>Total Licenses Sold</i>	<i>Total Revenue</i>
Acadia	105	1	..	4	..	..	9	17	33	5	87	3	4	3	53	2	2	327	3,029
Allen	8	..	..	1	..	..	4	31	1	12	9	1	..	..	28	..	..	95	601
Ascension	7	..	..	..	..	..	5	4	..	1	13	..	..	..	37	..	..	74	715
Assumption	16	..	..	..	..	..	3	61	..	4	5	..	..	..	38	..	..	141	1,640
Avoyelles	..	..	..	..	..	..	9	35	5	12	83	..	..	..	43	1	1	194	2,080
Beauregard	11	..	..	1	..	..	14	41	..	..	31	..	..	..	29	..	..	128	891
Bienvenue	..	..	..	..	..	..	7	8	..	..	17	1	..	..	30	..	..	69	520
Bossier	2	..	..	..	..	..	5	9	..	12	63	..	..	..	45	..	..	137	925
Caddo	4	..	..	..	..	..	16	19	5	14	98	..	..	..	188	8	..	352	2,560
Calcasieu	672	3	10	35	..	..	24	75	41	13	205	..	12	12	148	4	..	1,254	16,494
Caldwell	..	..	..	..	..	..	2	20	..	20	37	..	..	..	16	..	..	95	610
Cameron	210	1	..	73	..	4	36	3	13	1	23	..	7	1	20	..	..	387	5,370
Catahoula	..	..	..	..	..	..	5	40	13	22	52	..	..	..	17	6	4	159	1,870
Claiborne	..	..	..	..	..	..	..	1	..	..	4	..	..	..	17	..	..	22	110
Concordia	..	..	..	..	..	..	8	26	1	..	46	..	..	..	23	..	..	119	1,025
DeSoto	..	..	..	..	..	..	6	22	..	15	20	..	..	..	21	..	..	72	400
E. Baton Rouge	23	..	..	..	..	7	8	55	..	17	50	..	..	..	168	..	..	334	2,370
E. Carroll	..	..	..	..	..	..	2	13	10	17	56	1	..	..	24	1	..	124	925
E. Feliciana	1	..	..	..	..	..	..	3	..	4	2	..	..	..	7	..	..	17	105
Evangeline	18	2	..	..	..	..	5	49	13	24	81	2	2	..	95	..	..	295	1,755
Franklin	1	..	..	..	..	..	13	33	10	82	115	..	..	..	23	2	..	271	2,070
Grant	..	..	..	1	..	..	8	12	..	3	26	..	..	..	16	..	..	71	545
Iberia	248	..	..	1	..	1	14	18	3	9	20	..	16	3	57	2	1	380	6,156
Iberville	..	..	..	..	..	1	14	124	..	9	24	..	..	..	38	5	5	227	2,130
Jackson	..	..	..	..	..	..	4	5	..	4	15	1	..	..	34	..	..	64	355
Jefferson	846	2	..	19	..	24	13	4	..	2	17	..	5	12	142	28	4	1,123	20,858
Jefferson Davis	163	..	..	4	..	..	5	33	24	7	54	..	4	1	39	1	..	335	4,224
Lafayette	138	..	..	3	..	..	5	6	7	4	24	5	3	1	119	6	1	324	3,738
LaFourche	490	1	..	71	27	2	..	6	2	2	10	..	1	3	40	13	8	676	13,875
LaSalle	..	..	..	..	..	..	10	38	5	33	50	..	..	..	28	2	4	170	1,485
Lincoln	..	..	..	..	..	..	4	8	..	7	41	..	..	..	30	..	..	90	480
Livingston	1	..	..	..	..	..	11	17	..	7	10	..	..	..	15	1	..	62	455
Madison	..	..	..	..	..	..	7	13	..	19	34	..	..	..	17	1	..	85	625
Morehouse	..	..	..	..	..	..	9	47	4	43	67	1	..	..	55	1	..	225	1,345
Natchitoches	..	..	..	..	..	..	9	20	..	16	83	..	..	..	26	..	..	154	1,265
Orleans	310	2	1	51	33	42	42	4	4	4	17	..	3	16	498	24	1	1,052	12,526
Ouachita	..	..	15	84	29	..	39	68	9	88	268	1	..	26	105	6	..	584	4,005
Plaquemines	361	1	..	..	..	..	12	9	..	3	3	..	4	..	29	7	1	578	11,698
Pointe Coupee	..	..	..	1	..	..	16	12	4	4	15	..	..	..	23	4	..	71	436
Rapides	8	1	..	..	..	..	3	48	4	34	132	..	..	1	123	..	..	371	2,445
Red River	..	..	..	..	..	..	6	13	..	1	7	1	..	..	9	..	..	34	215
Richland	..	..	..	..	..	..	6	17	3	53	97	2	..	..	30	2	..	210	1,340
Sabine	..	..	..	..	..	..	6	21	..	8	21	..	..	..	21	..	..	77	405

Exhibit 13 (Continued)

Parish	S. W. Shrimp Trawl Vessel	S. W. Fish Vessel	Menhaden & Vessel	Oyster Tonnyge	Oyster Dredging	Oyster Shop—Resale	Commercial Fisherman & Boat	Hoop Net	F. W. Seine	F. W. Trawl Net	F. W. Gill Net	Fish Farmer	S. W. Seine	S. W. Trawl Net	Retail Dealer	Wholesale Dealer	Wholesale Agent	Total Licenses Sold	Total Revenue
St. Bernard	260	..	..	22	14	7	3	2	..	..	5	..	..	9	32	6	1	361	\$ 6,648
St. Charles	89	..	..	..	..	..	3	5	..	..	4	..	..	..	30	5	5	144	2,260
St. Helena	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	30
St. James	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	35	410
St. John	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32	440
St. Landry	32	..	..	..	..	..	22	50	..	..	3	..	..	..	..	..	..	32	2,830
St. Martin	16	..	..	..	..	..	6	68	..	..	94	..	..	..	..	..	..	346	1,970
St. Mary	392	3	9	..	..	..	49	75	..	18	41	1	..	..	75	13	11	182	13,230
St. Tammany	25	..	..	2	2	..	71	30	..	1	9	..	..	5	27	1	..	174	1,417
Tangipahoa	9	..	..	7	6	..	9	11	..	5	..	..	..	..	68	5	1	138	1,437
Tensas	..	..	..	..	..	..	1	7	..	8	29	..	..	..	18	..	..	65	715
Terrebonne	1,361	1	11	56	28	17	6	8	..	4	..	..	..	..	58	60	13	1,649	35,517
Union	..	..	..	3	..	2	9	65	..	41	145	..	..	19	17	..	..	279	1,730
Vermilion	432	4	6	..	..	..	29	9	13	2	66	..	18	..	90	4	1	679	9,623
Vernon	3	..	..	..	..	..	21	11	..	..	19	..	..	..	14	..	..	68	385
Washington	..	..	..	..	..	..	15	23	..	..	11	..	..	..	24	..	..	74	410
Webster	..	..	..	..	..	..	5	29	..	31	99	..	..	..	55	..	..	219	1,400
W. Baton Rouge	2	..	..	..	..	..	2	8	..	1	11	..	..	..	7	..	..	31	190
W. Carroll	..	..	..	..	..	..	2	23	..	19	70	..	..	..	17	..	..	131	805
W. Feliciana	..	..	..	..	..	..	..	1	..	3	4	..	..	..	11	..	..	19	110
Winn	..	..	..	..	..	..	5	18	1	1	14	..	..	..	19	..	..	58	320
TOTAL	6,290	23	52	438	144	115	668	1,557	267	813	2,791	22	94	114	3,269	282	79	17,018	\$218,548
LOUISIANA	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	118	4,515
Alabama	116	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	40	1,730
Florida	38	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	478	13,871
Mississippi	246	6	17	86	71	..	3	2	1	4	19	..	2	18	1	1*	1	689	17,943
Texas	606	11	10	10	..	..	30	1	..	..	6	..	7	5	1	2*	..	..	..
TOTAL	1,006	18	28	96	71	..	34	3	1	4	25	..	9	24	2	3	1	1,325	\$ 38,059
NON-RES.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1965 Total	7,296	41	80	534	215	115	702	1,560	268	817	2,816	22**	103	138	3,271	285	80	18,343	\$256,607
1964 Total	7,397	61	75	854	217	106	716	1,476	299	788	2,663	..	105	144	3,076	284	66	18,327	256,951
Increase	101	20	5	320	2	9	84	84	31	29	153	22	2	6	195	1	14	16	\$ 344
Decrease	..	..	..	..	..	..	14	..	..	..	..	..	..	..	..	..	..	..	..
% Increase	..	3.28	6.7	37.5	0.9	8.5	2.0	5.7	10.4	3.7	5.7	..	1.9	4.2	6.3	0.4	21.2	0.09	..
% Decrease	1.4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0.13

*Non-Resident Wholesaler Minnow Dealer.
**First Year License Issued.

Exhibit 14

1964 MISCELLANEOUS LICENSES
SOLD BY PARISH, STATE AND CLASS

Parish	Hunting Club	Hunting Preserve	Game Breeder	Fur Buyer	Fur Dealer	Total Licenses	Total Revenue
Acadia	1	..	7	2	..	10	\$ 125
Allen	..	..	1	1	..	2	35
Ascension	..	..	..	2	..	2	50
Assumption	5	..	1	4	..	10	135
Avoyelles	1	..	1	3	..	5	90
Beauregard	1	2	1	1	..	5	440
Bienville	3	..	..	..	..	3	15
Bossier	7	..	2	..	..	9	55
Caddo	6	..	8	6	..	20	260
Calcasieu	7	..	11	2	..	20	195
Caldwell	42	..	..	..	..	42	210
Cameron	6	..	..	3	..	9	105
Catahoula	1	..	..	..	..	1	5
Claiborne	6	..	1	..	..	7	40
Concordia	8	..	2	..	..	10	60
DeSoto	..	..	2	1	..	3	45
E. Baton Rouge	14	..	6	2	..	22	180
E. Carroll	27	..	..	..	1	28	285
E. Feliciana	..	1	..	..	..	1	200
Evangeline	1	..	1	..	..	2	15
Franklin	11	..	..	1	..	12	80
Grant	2	..	3	..	..	5	40
Iberia	..	..	1	3	..	4	85
Iberville	5	..	1	1	..	7	60
Jackson	12	..	4	..	..	16	100
Jefferson	2	..	8	10	..	20	340
Jefferson Davis	8	..	2	2	..	12	110
Lafayette	..	..	4	..	..	4	40
Lafourche	..	..	4	9	..	13	265
LaSalle	1	..	..	1	..	2	30
Lincoln	3	..	2	..	..	5	35
Livingston	..	..	4	3	..	7	115
Madison	78	..	..	..	..	78	390
Morehouse	41	..	..	..	..	41	205
Natchitoches	3	1	..	..	..	4	215
Orleans	7	..	6	4	8	25	1,395
Ouachita	21	..	2	..	1	24	275
Plaquemines	1	..	1	6	..	8	165
Pointe Coupee	4	..	1	1	..	6	55
Rapides	4	1	2	2	..	9	290
Red River	..	..	..	1	..	1	25
Richland	38	..	1	1	..	40	225
Sabine	..	..	1	..	..	1	10
St. Bernard	..	..	2	7	..	9	195
St. Charles	3	..	5	4	1	13	315
St. James	1	..	1	..	..	2	15
St. John	..	..	1	..	..	1	10
St. Landry	1	..	7	1	1	10	250
St. Martin	..	..	..	1	..	1	25
St. Mary	1	..	1	13	1	16	490
St. Tammany	..	..	7	1	1	9	245
Tangipahoa	..	..	7	1	..	8	95
Tensas	9	..	1	1	..	11	80
Terrebonne	..	..	2	25	1	28	795
Union	6	..	1	..	..	7	40
Vermilion	7	..	4	5	1	17	350
Vernon	1	..	..	1	..	2	30
Washington	..	..	1	2	..	3	60
Webster	1	..	2	3	..	6	100
W. Baton Rouge	2	..	..	..	..	2	10
W. Carroll	7	..	..	..	..	7	35
W. Feliciana	7	..	..	..	..	7	35
Winn	1	..	..	1	..	2	30
TOTAL							
LOUISIANA	424	5	133	138	16	716	\$10,300
Arkansas	1	..	..	..	1	2	305
Mississippi	1	..	..	..	..	1	5
New York	..	..	..	..	2	2	600
Texas	..	..	1	..	1	2	310
TOTAL	426	5	134	138	20	723	\$11,520

Exhibit 15

1965 MISCELLANEOUS LICENSES
SOLD BY PARISH, STATE AND CLASS

Parish	Hunting Club	Hunting Preserve	Game Breeder	Fur Buyer	Fur Dealer	Total Licenses	Total Revenue
Acadia	2	..	4	1	..	7	\$ 75
Allen	..	..	..	1	..	1	25
Ascension	2	..	..	1	..	3	35
Assumption	5	..	..	1	..	6	50
Avoyelles	1	..	4	2	..	7	95
Beauregard	2	1	1	1	..	5	245
Bienville	2	..	..	..	..	2	10
Bossier	11	..	1	..	..	12	65
Caddo	10	..	4	..	..	14	90
Calcasieu	16	..	13	3	..	32	285
Caldwell	33	..	..	..	..	33	165
Cameron	4	..	1	2	..	7	80
Catahoula	7	..	..	..	..	7	35
Claiborne	4	..	1	..	..	5	30
Concordia	12	..	2	..	..	14	80
DeSoto	1	..	2	..	..	3	25
E. Baton Rouge	16	1	7	2	..	26	400
E. Carroll	30	..	..	..	..	30	150
E. Feliciana	2	..	..	..	..	2	10
Evangeline	1	..	..	..	..	1	5
Franklin	50	..	..	2	..	52	300
Grant	2	..	3	..	..	5	40
Iberia	..	..	1	5	..	6	135
Iberville	5	..	2	..	..	7	45
Jackson	13	..	4	..	..	17	105
Jefferson	2	..	6	12	1	21	520
Jefferson Davis	3	..	5	2	..	10	115
Lafayette	2	..	2	..	..	4	30
Lafourche	..	..	3	12	1	16	480
LaSalle	7	..	..	1	..	8	60
Lincoln	4	..	3	..	..	7	50
Livingston	3	..	3	3	..	9	120
Madison	71	..	..	..	..	71	355
Morehouse	35	..	..	..	..	35	175
Natchitoches	2	1	..	..	..	3	210
Orleans	9	..	6	6	5	26	1,005
Ouachita	31	..	2	1	..	34	200
Plaquemines	..	..	1	7	..	8	185
Pointe Coupee	4	..	..	1	..	5	45
Rapides	5	1	3	2	..	11	305
Red River	..	..	..	1	..	1	25
Richland	42	..	1	..	..	43	220
Sabine	..	..	1	..	..	1	10
St. Bernard	..	..	4	6	..	10	190
St. Charles	1	..	6	4	..	11	165
St. James	..	..	1	..	..	1	10
St. John	..	..	1	..	..	1	10
St. Landry	1	..	6	1	..	8	90
St. Martin	..	..	..	2	..	2	50
St. Mary	2	..	1	10	1	14	420
St. Tammany	..	1	5	1	1	8	425
Tangipahoa	1	..	5	5	..	11	180
Tensas	3	..	1	1	..	5	50
Terrebonne	..	..	3	16	1	20	580
Union	4	..	1	..	..	5	30
Vermilion	3	..	5	6	1	15	365
Vernon	1	..	..	1	..	2	30
Washington	..	..	1	2	..	3	60
Webster	3	..	..	..	1	4	165
W. Carroll	6	..	..	..	1	7	180
W. Feliciana	3	..	1	..	..	4	25
Winn	2	..	..	1	..	3	35
TOTAL							
LOUISIANA	481	5	127	125	13	751	\$ 9,750
Arkansas	2	..	..	..	1	3	310
Mississippi	2	..	..	..	..	2	10
New York	..	..	..	..	2	2	600
Texas	..	..	..	..	1	1	300
TOTAL	485	5	127	125	17	759	\$10,970

Exhibit 16
NUMBER OF HUNTING LICENSES SOLD
SEASONS 1939-1940 THROUGH 1964-1965

Exhibit 17
LICENSES SOLD BY PARISHES,
1963-64 HUNTING SEASON

Season	Total Licenses	Hunting Resident Season	Hunting Non- Resident Season	Hunting Non- Resident	Hunting Big Game
1939-40	98,167	93,587	1,335	3,245	....
1940-41	116,653	115,336	166	1,151	....
1941-42	146,648	144,349	495	1,804	....
1942-43	119,543	118,300	163	1,080	....
1943-44	94,609	93,334	181	1,094	....
1944-45	124,485	121,767	407	2,311	....
1945-46	162,872	160,795	409	1,681	....
1946-47	170,396	169,652	744	* .....	....
1947-48	176,715	175,482	1,233	* .....	....
1948-49	222,201	221,702	499	* .....	....
1949-50	235,447	234,964	483	1,140	....
1950-51	235,472	234,195	137	1,140	....
1951-52	235,855	234,177	192	1,486	....
1952-53	209,665	207,428	169	2,068	....
1953-54	251,488	248,496	**2,992	....	....
1954-55	242,456	239,695	**2,761	....	....
1955-56	246,731	243,756	**2,975	....	....
1956-57	287,810	284,844	**2,966	....	....
1957-58	284,279	281,708	**2,571	....	....
1958-59	275,622	272,756	**2,866	....	....
1959-60	280,672	278,288	**2,384	....	....
1960-61	317,087	257,438	528	2,659	56,462
1961-62	309,367	247,227	381	1,748	60,011
1962-63	332,513	260,862	367	1,814	69,470
1963-64	347,680	266,556	442	2,755	77,927
1964-65	366,976	278,500	431	3,296	84,749

*No trip licenses issued during these years.

**Non-Resident sold on a reciprocal basis. These licenses include both season and trip.



This is the machine room of the Accounting Section. Here IBM and other machines expedite the Commission's payroll, sign checks, burst and stack forms, and maintain records which are vital to smooth operation of the Commission.

Parish	Basic Res. \$2.00	N. R. Season \$25.00	N. R. Trip \$5.00	Big Game \$2.00
Acadia	4,125	0	5	243
Allen	3,577	4	113	1,767
Ascension	2,658	..	1	372
Assumption	1,303	..	..	177
Avoyelles	4,151	..	19	875
Beauregard	2,857	9	65	1,131
Bienville	2,171	1	12	711
Bossier	5,570	..	15	2,349
Caddo	14,833	5	37	6,115
Calcasieu	13,631	12	459	2,531
Caldwell	1,643	3	14	1,093
Cameron	1,230	122	468	48
Catahoula	1,769	2	16	1,078
Claiborne	1,629	17	27	750
Concordia	3,195	88	93	2,096
DeSoto	2,192	4	17	699
E. Baton Rouge	16,465	1	30	3,933
E. Carroll	1,554	10	73	1,023
E. Feliciana	1,296	1	3	233
Evangeline	4,003	..	8	1,021
Franklin	3,494	..	32	2,472
Grant	1,037	..	7	1,071
Iberia	4,347	..	13	285
Iberville	2,301	..	..	437
Jackson	2,405	2	15	1,383
Jefferson	10,867	..	3	693
Jefferson Davis	3,648	..	73	349
Lafayette	6,485	..	35	511
Lafourche	6,086	..	..	291
LaSalle	2,751	1	6	1,487
Lincoln	2,515	..	55	1,317
Livingston	3,488	..	..	1,215
Madison	1,749	27	107	1,341
Morehouse	4,637	9	59	2,849
Natchitoches	4,013	1	55	1,492
Orleans	13,196	10	95	887
Ouachita	13,228	1	35	6,811
Plaquemines	1,741	..	..	168
Pointe Coupee	1,920	..	..	525
Rapides	11,847	5	120	4,232
Red River	1,002	..	18	528
Richland	3,385	3	29	2,018
Sabine	2,570	3	40	1,252
St. Bernard	1,554	1	15	201
St. Charles	2,142	..	..	239
St. Helena	733	..	2	217
St. James	1,351	..	1	239
St. John	1,021	..	..	122
St. Landry	7,815	1	14	1,361
St. Martin	2,002	..	1	148
St. Mary	4,543	..	14	549
St. Tammany	5,140	34	27	626
Tangipahoa	5,944	6	11	784
Tensas	1,574	13	68	1,200
Terrebonne	5,582	..	..	244
Union	2,554	11	35	1,626
Vermilion	3,969	1	172	216
Vernon	3,978	14	35	2,123
Washington	5,202	8	19	776
Webster	4,376	2	12	1,825
W. Baton Rouge	2,636	..	..	435
W. Carroll	2,501	8	36	1,792
W. Feliciana	908	..	2	227
Winn	2,467	2	19	1,118
TOTAL				
1963-1964	266,556	442	2,755	77,927
TOTAL				
1962-63	260,862	367	1,814	69,470
Increase	5,694	75	941	8,457
% Increase	(2.2%)	(20.4%)	(51.9%)	(12.2%)
% Decrease	....	....	....	....

Exhibit 18
LICENSES SOLD BY PARISHES
1964-65 HUNTING SEASON

Parish	Basic Res. \$2.00	N. R. Season \$25.00	N. R. Trip \$5.00	Big Game \$2.00
Acadia	4,442	..	8	229
Allen	3,506	9	133	1,591
Ascension	2,704	..	..	495
Assumption	1,249	..	..	191
Avoyelles	4,037	..	4	969
Beauregard	2,856	8	45	1,115
Bienville	2,000	..	11	828
Bossier	5,592	1	14	2,645
Caddo	15,619	3	79	6,993
Calcasieu	14,353	21	536	2,627
Caldwell	1,701	1	13	1,115
Cameron	1,303	118	515	45
Catahoula	1,885	2	21	1,062
Claiborne	1,801	12	39	884
Concordia	3,232	87	146	2,060
DeSoto	2,343	9	35	860
E. Baton Rouge ..	16,592	1	36	4,534
E. Carroll	1,674	5	79	1,040
E. Feliciana	1,376	1	8	263
Evangeline	4,128	..	2	1,085
Franklin	3,481	..	45	2,419
Grant	2,129	1	13	1,059
Iberia	4,318	1	3	312
Iberville	2,175	..	3	554
Jackson	2,476	2	14	1,509
Jefferson	12,110	..	6	765
Jefferson Davis ..	3,935	2	99	346
Lafayette	7,037	2	51	582
Lafourche	6,241	..	2	363
LaSalle	2,886	2	27	1,703
Lincoln	2,886	1	5	1,450
Livingston	3,779	..	..	1,340
Madison	1,831	22	111	1,352
Morehouse	4,847	19	110	3,105
Natchitoches	4,360	1	31	1,672
Orleans	14,635	10	153	1,193
Ouachita	13,990	..	58	7,494
Plaquemines	1,962	..	..	176
Pointe Coupee ...	1,828	1	..	588
Rapides	12,200	2	98	4,474
Red River	1,040	1	26	574
Richland	3,515	..	28	2,151
Sabine	2,727	1	23	1,320
St. Bernard	1,806	2	2	182
St. Charles	2,380	..	6	309
St. Helena	737	..	2	231
St. James	1,339	..	..	234
St. John	1,160	..	..	142
St. Landry	8,043	..	12	1,360
St. Martin	2,123	..	1	162
St. Mary	4,472	..	5	596
St. Tammany	5,484	33	52	782
Tangipahoa	6,311	3	12	958
Tensas	1,470	5	83	1,100
Terrebonne	5,378	..	6	287
Union	2,851	13	53	1,864
Vermilion	4,297	6	258	252
Vernon	4,385	7	60	2,382
Washington	5,243	8	28	966
Webster	4,477	1	15	2,141
W. Baton Rouge ..	1,829	..	..	392
W. Carroll	2,613	5	57	1,879
W. Feliciana	843	..	..	224
Winn	2,478	2	14	1,174
TOTAL				
1964-65	278,500	431	3,296	84,749
TOTAL				
1963-64	266,556	442	2,755	77,927
Increase	11,944	..	541	6,822
Decrease	..	11	..	..
% Increase	(4.5%)	..	(19.6%)	(8.8%)
% Decrease	..	(2.5%)	..	..

Exhibit 19
NUMBER OF FISHING LICENSES SOLD
SEASONS 1939 THROUGH 1964-1965

Season	Total	Fishing Resident	Fishing Non- Resident	Fishing Non- Resident 7-Day Trip
1939	27,096	12,649	14,447	**
1940	31,014	16,140	14,874	**
1941	52,695	38,080	14,615*	**
1942	41,661	30,608	11,053*	....
1943	36,112	29,492	3,332	3,288
1944	33,239	25,755	3,743	3,741
1945	35,002	27,000	4,088	3,914
1946	52,909	42,621	5,808	4,480
1947	64,055	59,353	4,702	**
1948	66,797	63,657	3,140	**
1949	82,942	72,397	5,970	4,575
1950	83,068	72,044	5,872	5,152
1951	89,337	76,516	6,477	6,344
1952	102,715	89,159	6,207	7,349
1953	205,049	178,994	10,087	15,968
1954	217,282	187,832	12,048	17,402
1955	220,835	187,466	13,917	19,452
1956	218,757	186,106	14,817	17,834
1957	188,874	159,664	14,124	15,086
1958	192,290	165,566	13,364	13,360
1959	179,820	155,074	14,736	10,010
1960	153,848	134,231	10,519	9,098
1960-61***	139,899	127,198	4,913	7,788
1961-62	224,601	202,297	8,508	13,796
1962-63	220,335	196,419	9,064	14,852
1963-64	204,224	183,320	8,556	12,348
1964-65	217,192	196,138	8,779	12,275

*Includes both annual and 7-day trip.
 **No 7-day trip licenses issued during these years.
 ***Licenses issued on fiscal year basis starting with 1960-61 season.

Exhibit 20
LICENSES SOLD BY PARISHES
1963-64 FISHING SEASON

Parish	Resident \$1.00	N.R. Annual \$5.00	N. R. Trip \$2.00	Trapping \$2.00
Acadia	1,326	4	10	24
Allen	1,721	18	20	71
Ascension	1,670	..	6	8
Assumption	351	..	6	31
Avoyelles	1,680	24	256	39
Beauregard	2,425	58	149	42
Bienville	1,331	11	120	10
Bossier	6,119	22	377	15
Caddo	12,912	504	1,376	52
Calcasieu	11,214	807	383	84
Caldwell	312	5	12	33
Cameron	609	1,842	339	85
Catahoula	689	79	362	8
Claiborne	658	37	28	7
Concordia	1,632	1,407	1,219	8
DeSoto	639	36	57	25
E. Baton Rouge	12,972	175	181	13
E. Carroll	414	93	161	50
E. Feliciana	275	2	1	3
Evangeline	1,130	14	44	37
Franklin	805	2	26	38
Grant	1,175	9	71	23
Iberia	3,398	2	39	32
Iberville	1,348	2	9	16
Jackson	977	8	52	31
Jefferson	11,895	..	6	39
Jefferson Davis	1,672	1	9	121
Lafayette	4,206	10	48	4
Lafourche	2,963	..	4	131
LaSalle	1,156	101	293	15
Lincoln	900	1	29	11
Livingston	1,534	17	43	34
Madison	380	107	87	44
Morehouse	2,114	878	825	54
Natchitoches	3,111	268	2,524	24
Orleans	26,856	538	272	179
Ouachita	5,746	17	219	58
Plaquemines	1,181	..	..	85
Pointe Coupee	1,187	8	98	9
Rapides	8,976	34	227	65
Red River	276	50	233	19
Richland	810	3	31	68
Sabine	686	6	15	8
St. Bernard	3,607	6	5	32
St. Charles	1,842	2	30	43
St. Helena	79	..	2	10
St. James	601	..	..	7
St. John	604	1	2	19
St. Landry	4,244	11	73	38
St. Martin	1,241	3	23	26
St. Mary	2,591	12	53	392
St. Tammany	4,377	462	261	55
Tangipahoa	2,749	65	92	50
Tensas	622	199	538	20
Terrebonne	3,949	3	19	249
Union	507	102	48	25
Vermilion	1,251	6	3	100
Vernon	3,025	94	168	29
Washington	2,574	285	198	44
Webster	2,655	30	184	43
W. Baton Rouge	1,873	3	28	18
W. Carroll	333	8	40	51
W. Feliciana	125	..	1	1
Winn	1,040	64	313	24
TOTAL 1963-64	183,320	8,556	12,348	3,029
TOTAL 1962-63	196,419	9,064	14,852	3,666
Increase	..	..	..	..
% Increase	..	..	..	..
Decrease	13,099	508	2,504	637
% Decrease	(6.7%)	(5.6%)	(16.9%)	(17.4%)

Exhibit 21
LICENSES SOLD BY PARISHES,
1964-65 FISHING SEASON

Parish	Resident \$1.00	N.R. Annual \$5.00	N. R. Trip \$2.00	Trapping \$2.00
Acadia	1,334	4	6	24
Allen	1,725	16	15	73
Ascension	1,567	1	12	14
Assumption	318	3	..	38
Avoyelles	1,672	24	169	41
Beauregard	2,312	72	222	27
Bienville	1,001	12	105	7
Bossier	5,613	27	270	12
Caddo	12,518	576	1,564	45
Calcasieu	11,275	976	405	74
Caldwell	397	12	16	30
Cameron	694	2,143	455	105
Catahoula	547	65	302	10
Claiborne	735	41	25	9
Concordia	1,592	1,406	1,205	5
DeSoto	816	33	86	23
E. Baton Rouge	15,115	162	150	11
E. Carroll	392	105	100	33
E. Feliciana	274	1	5	3
Evangeline	1,363	5	76	30
Franklin	812	4	22	41
Grant	1,108	18	79	11
Iberia	3,360	3	28	35
Iberville	1,637	9	6	68
Jackson	841	5	57	22
Jefferson	14,057	5	16	57
Jefferson Davis	1,777	3	14	144
Lafayette	4,540	3	56	4
Lafourche	3,202	4	6	210
LaSalle	1,224	39	288	12
Lincoln	1,165	2	30	9
Livingston	1,920	5	60	35
Madison	388	99	58	52
Morehouse	2,284	647	567	42
Natchitoches	3,334	340	2,434	23
Orleans	29,376	291	258	289
Ouachita	5,739	26	204	39
Plaquemines	1,570	..	..	79
Pointe Coupee	1,418	11	101	8
Rapides	8,914	18	172	41
Red River	299	40	209	19
Richland	819	1	36	59
Sabine	676	6	13	8
St. Bernard	4,528	5	2	25
St. Charles	2,150	..	16	98
St. Helena	93	2	7	12
St. James	515	..	1	10
St. John The Baptist	802	5	5	14
St. Landry	4,367	10	74	30
St. Martin	2,421	9	36	27
St. Mary	2,169	7	48	288
St. Tammany	6,033	524	368	30
Tangipahoa	3,120	75	59	56
Tensas	580	138	482	19
Terrebonne	3,783	6	14	226
Union	978	266	125	21
Vermilion	1,118	..	5	122
Vernon	3,672	97	273	28
Washington	2,571	251	165	41
Webster	2,414	49	204	29
West Baton Rouge	1,435	3	20	9
West Carroll	442	21	52	41
West Feliciana	138	1	7	..
Winn	1,089	47	410	14
TOTAL 1964-65	196,138	8,779	12,275	3,061
TOTAL 1963-64	183,320	8,556	12,348	3,029
Increase	12,818	223	..	32
% Increase	(7.0%)	(2.6%)	..	(1.1%)
Decrease	..	..	73	..
% Decrease	..	..	(0.6%)	..

Exhibit 22

REPORT OF CERTIFICATES OF NUMBER ISSUED TO MOTORBOATS

Certificates Issued During Period—January 1, 1965-June 30, 1965

Hull Material	Under 16 ft.		16 to Less Than 26 ft.		26 to Less Than 40 ft.		40-65 ft.		Over 65 ft.		Total	
	Inboard	Outboard	Inboard	Outboard	Inboard	Outboard	Inboard	Outboard	Inboard	Outboard	Inboard	Outboard
Wood	25	1,616	336	834	137	10	11	..	1	..	510	2,460
Steel	3	13	7	31	50	18	11	3	2	..	73	65
Aluminum	5	1,085	18	152	23	10	1	..	..	..	47	1,247
Plastic	3	943	103	770	9	1	3	..	..	..	118	1,714
Other	4	274	10	188	1	3	1	1	..	..	16	466
TOTAL	40	3,931	474	1,975	220	42	27	4	3	..	764	5,952

Certificates Cancelled and Withdrawn During Period

Wood	12	971	145	338	44	4	8	..	..	..	209	1,313
Steel	..	11	5	10	11	5	1	..	..	..	17	26
Aluminum	1	348	..	30	1	3	..	..	..	..	2	381
Plastic	..	248	2	111	..	..	..	..	..	..	2	359
Other	1	64	..	26	1	..	..	..	..	..	2	90
TOTAL	14	1,642	152	515	57	12	9	..	..	..	232	2,169

Total Valid Certificates Outstanding To Date—July 1, 1960-June 30, 1966

Wood	355	18,304	4,388	12,313	2,901	188	262	7	6	..	7,912	30,812
Steel	63	101	254	236	873	184	106	22	3	..	1,299	543
Aluminum	35	8,464	85	1,501	99	45	10	1	..	..	229	10,011
Plastic	37	6,805	414	4,861	40	30	4	2	..	..	495	11,698
Other	13	1,924	54	1,231	11	23	4	3	..	..	82	3,181
TOTAL	503	35,598	5,195	20,142	3,924	470	386	35	9	..	10,017	56,245

Education and Publicity Division

THE EDUCATION AND PUBLICITY DIVISION is always on the "go" because it is charged with keeping the public informed on all matters pertaining to wildlife conservation in our state and also on a national level.

The staff also works with other divisions in the Commission in publicizing their activities. This includes photography, writing, press releases, radio and TV programming, public relations and exhibit work, the answering of numerous questions on wildlife which come from the hundreds of thousands of people who visit our museum in New Orleans; also from the myriads of school children who are engaged in wildlife programs now being conducted practically in every corner of the nation.

The firm lending library, which has been moved to Baton Rouge, has served an unprecedented number of people. The museum on Royal Street attracts more than 100,000 visitors a year from every state in the union and from many foreign countries. It has not only focused attention on the conservation of wildlife in all age groups but has also called attention to the importance of our diminishing wildlife species.

The main room of the museum, which measures 35 feet by 90 feet, exhibits most of the three hundred and eighty-seven species of birds that have been recorded in Louisiana. In addition there



STEVE HARMON
Chief

are also exhibits of bird eggs, mammals, fish, turtles and snakes. The museum is open Monday through Friday each week with visiting hours from 8:30 A.M. to 5:00 P.M.

Twenty-five species of ducks and geese are prominently displayed in life-like flight. This attractive exhibit is located in a separate room 30 feet by 45 feet with the actual waterfowl display totalling ninety feet in length. In this same room visitors may view many smaller habitat groups, from the little Eastern chipmunk to the stately wild turkey. Here also is the Prairie Chicken, now extinct in Louisiana, and shown in native surroundings.

The museum is the only one of two in the nation operated by a state agency. Admission is free. In conjunction with the museum portable exhibits are sent to and set up at every major fair and festival and at many district and regional affairs; also in hotels on the occasion of large wildlife meetings and conventions.

The film library has in stock wildlife, sound and color, motion pictures which are shown on



E. T. WALDO
Information Representative



McFADDEN DUFFY
Information Representative

request to the aforementioned, also to wildlife groups, church organizations, scout meetings, sportsman groups, garden clubs, schools and the like. The average circulation of films is 75 per month.

Due to increased, unsolicited, subscriptions, the LOUISIANA CONSERVATIONIST, which was a monthly publication, has been changed to a bi-monthly. This has been done in order that the division may keep within its budget and keep up the high standard of the magazine which has won national acclaim. The publication at this present writing goes to 87,500 persons, most of them residents of the State of Louisiana. It has been necessary to hold out-of-state distribution to a minimum because of increased requests from the people of Louisiana.

Special pamphlets are written on various phases of wildlife and management. These appear in a series which now numbers well over one hundred, and which are distributed through the main office, the office in Baton Rouge, the regional offices and upon written request.

The regularly produced publications include hunting and fishing regulations and a special booklet on the hunting and fishing laws as passed by the state legislature. This latter booklet is revised after each session of the legislature and distributed free of charge, as are all of the other publications.

This biennial report is written or assembled by the staff of this division and a great number of the pictures have been taken by a full-time photographer. The biennial report is sent to the Governor, members of the legislature, each school in Louisiana, also other state bodies, and to others upon request.

The photographic department also keeps a still film library which contains thousands of nega-

tives and photographs which are filed and recorded. This division is also charged with the promotion of the state's natural resources insofar as wildlife and fish are concerned. It, above all, is a clearing house for all types of information sought by the people of this state and out-of-state residents, bureaus and institutions. By answering thousands of queries which come through this office, the staff is able to acquaint, non-residents and Louisianians alike, with the enormous wildlife resources of Louisiana.

Exclusive of photographs and stories of special events this department also issues approximately 15 new releases per month to the state's 130 weekly and daily newspapers, radio and TV stations. The public acceptance of these releases has been remarkable, according to confirmation by our clipping service.

The division regards the favorable sentiment demonstrated by the public towards the decisions and aims of the commission as a reflection that the good will and public relations efforts have produced results. This is attributed largely to the contacts made by the division with luncheon clubs, sportsmen's organizations, civic and service clubs, school and church groups, garden clubs and other organizations.

Speakers from the division are available to address wildlife, veteran, civic, service, youth clubs along with garden clubs, church organizations and others on request. In addition, motion pictures are often used.

Exclusive of the CONSERVATIONIST, approximately 100,000 pieces of literature are distributed by the division each year upon request. This figure does not include fishing and hunting regulations and pamphlets secured, in large numbers, from other sources, such as wild fowl identification, state maps, federal regulations and the like.



EDOUARD MORGAN
Museum Curator



ROBERT DENNIE
Photographer

Law Enforcement Division

ADVANCES in the law enforcement division of the Commission during the past two years have been manifested in every facet of its organization. To mention a few, personnel participated wholeheartedly in rescue work in and after hurricanes Hilda and Betsy.

In addition practically every man in the organization attended the In Service Training School at Louisiana State University. One hundred and three men also attended the Police Training Academy, conducted by the Louisiana State Police, at Baton Rouge. Our men attended boat safety schools in Pennsylvania and Virginia thus adding to the sum total of their knowledge in this field. Agents have been active in attending civic and sportsmen's club meetings and have worked intensively with Boy Scouts and other youth groups and with the Civil Defense people.

Several new patrol boats and many new outboard motors have been added to our enforcement fleet. Trailers, for agents in the field, have been made available. And—let us not forget our new uniforms that have caused much favorable comment throughout the state and elsewhere.

It would take a volume to mention specifically the achievements of the Law Enforcement division during the past two years; however, we will cite several outstanding cases made against game law violators during this period.

One of the most important accomplishments was a raid made by a fast-moving group of enforcement agents. It was a crackdown on illegal traffic in undersized catfish by commercial fish processing plants in south-central Louisiana.

Before the raid, which lasted almost two days, eleven illegal dealers had been charged with violating fish and game laws. Hundreds of catfish under 14 inches in length were seized and given to orphanages, hospitals and similar organizations and the possessors charged with violations.

The series of raids was aimed at breaking up buying and selling of tens of thousands of pounds of undersized catfish. Many thousands of these fish were being shipped out of Louisiana in refrigerated trucks.

Wildlife agents from all parts of Louisiana were assembled at a central meeting place and



COBURN HOOD
Acting Chief

thoroughly briefed on the widespread violations of laws governing commercial fishing and dealing in catfish.

Following the briefing session the agents were paired off into teams and left in unmarked cars for their assigned areas. Strict silence was maintained until after a specified time for the simultaneous raids to begin.

During the briefing session, agents were informed that the series of raids had been prompted by hundreds of letters and telephone calls from persons engaged in legal, commercial fresh water fishing and processing of fish. It was pointed out that the complainants, who were obeying the state fish and game laws, were resentful of other operators who had been flagrantly disobeying such laws.

Even though game and boating law arrests were lower for the period, agents had a lively time and there were some unusual incidents. On one occasion there was even a bloodhound chase after one game agent was shot in the leg, another



LEONARD NEW
Assistant Chief



Division Chief and Area Supervisors. Sitting: Left to right: Frank Trocchiano, Wildlife Agent III, District VIII, New Orleans; Leroy Seal, Wildlife Agent III, District VII, Baton Rouge; Vincent Purpera, Jr., Wildlife Agent III, District VI, Opelousas; James F. Ellis, Wildlife Agent III, District V, DeRidder; Wm. J. Gillespie, Jr., Wildlife Agent III, District IV, Ferriday; Earl Nugent, Wildlife Agent III, District III, Tioga, La.; Harvey Christian, Wildlife Agent III, District II, Monroe; E. J. "Jack" Stanfield, Wildlife Agent III, District I, Minden. Standing: Left to right: I. Coburn Hood, Acting Chief, Baton Rouge; J. L. DeBlieux, Wildlife Agent IV, District 1 & 3, Natchitoches; Jim Parker, Wildlife Agent IV, District 2 & 4, Tallulah; Lesma Hebert, Wildlife Agent IV, District 5 & 8, Labadieville; Leonard New, Assistant Chief, Kentwood; A. L. Prechac, Jr., Wildlife Agent III, Main Office, New Orleans. Missing from Picture: Charles Ventrella, Wildlife Agent IV, District 6 & 7, Batchelor and Jimmie J. Hairford, Wildlife Agent III, Statewide, Plaquemine, La.

game agent was bitten by a six-foot alligator and another attacked by a bear.

At Varnado, it took two men with a tire tool to free wild life agent Lavert Strahan from the jaws of a six and one-half foot alligator. Strahan was hospitalized with severe cuts after having been bested by the alligator. It all happened after Strahan, Captain Leroy Seal and Willie J. Thomas had captured the saurian on a complaint and took it from the pond of the Crown-Zellerbach paper mill at Bogalusa and were hauling it to Varnado to be released. Strahan untied the animal's mouth and was reaching for a rope around its neck when the angry reptile snapped at him, catching his left thumb and index finger.

The alligator held on with bulldog grip, and the other two men worked for five minutes before prying its jaws open with a tire iron to free Strahan. The game agent wisely stayed quiet in spite of the pain until he was free. Strahan was taken to a hospital. His thumb and forefinger were cut badly. Seal later returned to the alligator, untied it from a tree and released it.

Near Kentwood Captain Jesse "Mack" Sanders was shot after dark when he attempted to arrest a hunter for headlighting rabbits. Admitted to Pike Clinic, Sanders was found to be painfully, but not seriously, injured when birdshot splattered

both legs. Later the agents tracked down his assailant with aid of bloodhounds and charged him with attempted murder, aggravated battery, resisting arrest, and spotlighting rabbits.

Another important case was made under the direction of Acting-Chief of Enforcement Coburn Hood when Hood assigned Game Agents Lester



William Gillespie, Agent III, Sidney Emfinger, Agent II and Mayo York, Agent I, starting on routine patrol in woods with walkie-talkies.



Receiving a "flock" of ducks confiscated by state and federal wildlife agents are nuns and children of Hope Haven Institute in Marrero. The ducks, confiscated from hunters with illegal numbers of birds in their possession, were donated to the orphanage for the holiday season. Standing on the platform with the children are (from left) Sister Mary Timothy, Sister Mary Mechelatt, Sister Mary Gertrude Marie, Sister Mary Omes, Sister Mary Felix and agent Alex Coulon. Standing in the foreground are agents Irwin Dares and Ray Montet and Capt. Charles Miller.

Hebert, Russel Landry and Murrell Hebert to conduct an undercover investigation as to the scope of illegal selling of deer in Louisiana.

During this operation, which lasted from November of 1965 to January 1966 the agents were able to make several purchases of illegal deer from three persons with marked money and before the case broke they were able to get commitments from the illegal deer hunters for as many as 50 deer and an unlimited supply of ducks. The violators were arrested and are now on bond and the animals are being held as evidence.

One of the conspicuous cases made in this period was the arrest of a wholesale fish dealer who was charged with buying for resale, 1,030 pounds of undersized catfish. The dealer was caught at Des Allemands with the fish in his truck.

"Arrests of this type are not only unusual because of the size of the haul, but are also unique in that they result from the information often supplied by the growing class of tipsters among legitimate fishermen who want a fair shake for all," Hood pointed out.

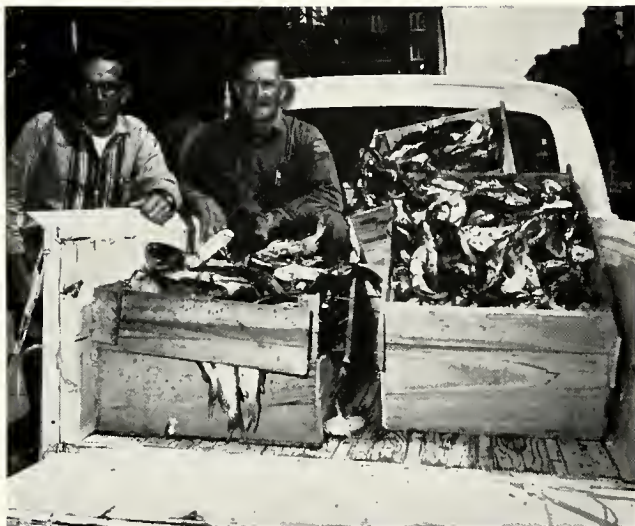
Sometimes the old story of "having a tiger by the tail" comes true, however, this time it was a bear. On answering a complaint that a bear was annoying people in the vicinity of Port Allen, wildlife game agents ran the bear down and quieted the animal with a tranquilizing bullet. They tied the bear up and brought it in a truck to a swampy spot in Pointe Coupee Parish and as they were in the act of releasing him old bruin woke up and grabbed the foot of Game Agent



Agents, Lloyd Smith and Prestley Mack with I. Coburn Hood, Acting Chief, Claude LeBlanc, Wharf Superintendent, and L. C. New, Asst. Chief viewing the new inboard-outboard boats recently purchased for use by the Enforcement Division for patrol work.



The Commission is making an all-out effort to stamp out traffic in alligators and now has an indefinite closed season on the saurians so that they may make a population comeback. The baby saurians were confiscated and released on game management areas to grow and propagate under the watchful eyes of wildlife game agents. With Kenneth Smith, assistant chief of the Fish and Game Division are Wildlife agents A. L. Camus, left, and Peter J. Trocchiano who seized the alligators.



Legitimate commercial fishermen no longer tolerate illegal operations and often report infractions to wildlife agents. Agents seen above received a report that this catch of 1,070 pounds of undersized catfish were to be shipped. The fishermen were arrested and the fish seized and turned over to charitable organizations as is the custom. Arresting agents were, left to right Ray Montet and Cullen J. Landry. Irwin Dares, the other arresting agent, is not in picture.

Leon Altazan. However, agents James Spruill and Elmo Torres succeeded in chasing the bear off to its new home in the swamp. Altazan was brought to the nearest hospital where his foot required some stitches.

In another of many incidents Game Agent Noice Begnaud of Carencro was wounded with a shotgun while arresting Harold Patin of Henderson. Patin, in turn was shot in the abdomen by game agent E. J. Cormier of Lafayette. Both Begnaud and Patin have recovered from their wounds.

Incidents, such as the aforementioned, go to prove that the game law enforcement agent, no matter how carefully he may identify himself, is still at the whim of the man on the other end of the gun.

In this case the St. Martin sheriff's office reported that Patin was hunting at night with a light and was approached by Begnaud and Cormier who clearly identified themselves. Nevertheless Patin fired on Begnaud with a twelve-gauge shotgun and Cormier shot Patin with his pistol.

When Hurricane Betsy delivered a body blow to Louisiana after rambling back and forth in the lower Atlantic, then taking a swipe at the Florida peninsula, swirling across Florida and into the Gulf, the Louisiana Wild Life and Fisheries Commission staff showed its true colors. It went into action immediately and remained in action for weeks.

Betsy's power-packed force with winds known to have gusts up to 175 mph slammed its ravaging way up the Mississippi River, boring in from the southeast portion of the state. The people did not know that Betsy would go down in history as the most destructive storm ever to rake the country.

Betsy struck on Thursday, September 9, 1965. When it appeared that the storm might strike Louisiana, preparations by the Commission were made. All personnel were alerted to be on standby, fully equipped. Those with boats were told to ready their craft for whatever emergency might occur.

On the Wednesday before the tropical storm struck, 24 men were moved into the Baton Rouge area from District 7. An additional 12 men from other parts of the state with boats were ordered to proceed to Baton Rouge.

On the day before the hurricane, an emergency meeting was called in the Director's Office in New Orleans. Outlying camps and installations along the coast were evacuated. Whatever equipment that could not be quickly brought out was battened down.

At the meeting in New Orleans, it was decided that Director J. D. Hair, Jr., and Coburn Hood, his executive assistant and state director of Civil Defense for the Louisiana Wild Life and Fisheries Commission would set up headquarters



Clean boats and in good running condition are a must for the Enforcement Division of the Louisiana Wild Life and Fisheries Commission. Wildlife Agents Frank Swayze and Holmes Brunson are cleaning and making a final inspection of equipment before a weekend patrol on Louisiana's lakes and streams.

in Baton Rouge in the main headquarters of Civil Defense.

On the day of the hurricane they had established a complete telephone and two-way radio contact system with all agents of the Commission.

The morning after the storm 24 agents with 12 boats were dispatched to Grand Isle and the Lafourche area. On the same day, using the Commissions two-way radio system, men were sent to New Orleans. There were 31 men with boats operating in the flooded sections of New Orleans, assisting in evacuation, rescue and other emergency tasks.

Commission planes went into operation on the day following the storm and hundreds of flying hours were recorded. One plane was assigned to patrol the area below New Orleans and relay information by radio. A second plane was assigned to the flooded area of New Orleans and directed operations of Commission agents in boats by two-way radio. The Widgeon repeatedly flew supplies to persons at Grand Isle, Venice and Pass-a-Loutre.

Since it was re-districted to eight districts instead of sixteen the Enforcement Division has continued to operate under this system. This was brought about in order to have clear supervision of agents. Each wildlife agent IV supervises two districts. The agents are: J. L. DeBlieux, in charge of Districts I and III; Jim Parker, in charge of

Districts II and IV; Lesma Hebert in charge of Districts V and VIII; and Charles Ventrella in charge of Districts VI and VII.

The eight districts are each supervised by an Agent III. They are: E. L. "Jack" Stanfield, Harvey Christian, Earl Nugent, Wm. Gillespie, Jr., James Ellis, Leroy Seal, Vincent Purpera, Jr. and Frank Trocchiano. Jimmie Hairford is assigned statewide and Alfred L. Prechac, to the main office.

Each district is comprised of several parishes. They are as follows:

District I

Bossier, Bienville, Caddo, Claiborne, DeSoto, Red River and Webster.

District II

East Carroll, West Carroll, Morehouse, Union, Lincoln, Ouachita, Richland and Jackson.

District III

Natchitoches, Winn, Sabine, Grant, Vernon Rapides and Avoyelles.

District IV

Madison, Caldwell, Franklin, LaSalle, Catahoula, Tensas and Concordia.

District V

Beauregard, Allen, Calcasieu, Jeff Davis, Cameron, Evangeline, Acadia and Vermilion.

District VI

Pointe Coupee, W. Baton Rouge, Lafayette, St. Landry, St. Martin and Iberville.

District VII

West Feliciana, East Feliciana, St. Helena, E. Baton Rouge, Livingston, Tangipahoa, Ascension, St. Tammany and Washington.

District VIII

Assumption, Iberia, Lafourche, St. Mary, Terrebonne, St. James, St. John, St. Charles, Jefferson, Orleans, St. Bernard and Plaquemines.

A majority of Louisiana's 64 parishes now have an Agent II supervising the Agent I's. There are 63 Wildlife Agent II's.

In addition to the above personnel there are also 130 Agent I's, seven Laborer Utilities, two Investigators, seven Captains, four Deckhands, and one Pilot.



District I: 1st Row—Tommie J. Wise, Shongaloo; Marvin Haynie, Shreveport; Jack Stanfield, Minden; and Hugh E. Hay, Jameston. 2nd Row—T. Garrett, Haynesville; Robert C. Person, Ringgold; K. C. Doty, Bossier City; and Curtis Menefee, Shreveport. 3rd Row—Norman Gamble, Grand Cane; Noble Speights, Longstreet; Francis B. Harper, Saline; and Claude W. Smith, Cotton Valley. 4th Row—Ronald B. Cason, Coushatta; Harmond T. Burgess, Mansfield; E. O. McCoy, Ringgold; Roy D. Odom, Homer; Clive A. Small, Rodessa; and Jack E. Weaver, Benton.



District II: 1st Row—Chappel C. Magee, Lake Providence; and Harvey Christian, Rayville. 2nd Row—Jim Parker, Tallulah; Spencer Maxwell, Ruston; Henry Albritton, Rayville; Henry W. Langston, Bastrop; and John C. Bowen, Bernice. 3rd Row—Kenneth Smith, Farmerville; Frank Burgess, Rayville; Jewel Williamson, Ruston; George Lobrano, Mangham; Holmes Brunson, Mangham; and Dan Mayo, Bastrop.



District II: 1st Row—Laurence Phillips, West Monroe; and Grady Floyd, Monroe. 2nd Row—James Hamilton, Downsville; J. A. Ford, Epps; Ray Harrison, Bastrop; and Ira Wyatt, Jonesboro. 3rd Row—Gene Flynn, Lake Providence; John Bullock, Epps; Quinton Fortenbery, Lake Providence; Lonnie Salsbury, Chatham; Charles Cockerham, Pioneer; and Frank Swayze, Monroe.



District III: 1st Row—J. L. DeBlieux, Natchitoches; Earl Nugent, Dry Prong; Jennings Self, Hornbeck; Elvis Rhodes, Provencal; Gerald Merritt, Alexandria; Jimmie Lee McCullough, Pitkin; Alvin Armand, Cottonport; Tracy Lucky, Natchitoches; and James T. Joyner, Chestnut. 2nd Row—Earl Corley, Pollock; Clyde Anthony, Many; Arnie Sasser, Deville; Victor Raborn, Goldonna; Jack Coleman, Pollock; Hoyt Harrington, Winnfield; and John Wheeler, Marksville. 3rd Row: Clarence Hood, Leesville; Wesley Slay, Dry Prong; Edward Walker, Marksville; Roy J. Perry, Seiper; Willis H. Taylor, Kisatchie; and Murrel Price, Seiper. Missing from Picture—Victor Raborn, Goldonna; Edgar Savell, Many; and Ed Tassin, Bordelonville.



District IV: 1st Row—Nelson Book, Monterey; Mayo York, Jonesville; Thomas January, Vidalia; Lonnie Hatton, Winnsboro; Rheo Stewart, Winnsboro; Sidney Emfinger, Newellton; and Jessie Laird, Tallulah. 2nd Row—A. C. Duckett, Columbia; A. D. Swayze, Jonesville; Theodore Forman, Monterey; James H. Roberts, Columbia; Manuel L. Duncan, St. Joseph; Edward Chevallier, Walters; and John D. McGraw, Delhi. 3rd Row—R. V. Herring, Newellton; Jim Parker, Tallulah; Oliver Taunton, Jonesville; and Cecil C. McGuffee, Enterprise.



District V: 1st Row—James F. Ellis, Sulphur; Clinton A. Patterson, Jennings; Lloyd C. Andrus, Lake Charles; Raymond Rowell, Elizabeth; and Murrel G. Cole, DeRidder. 2nd Row—Lesma Hebert, Labadieville; Barnett Jardell, Sulphur; Arnold Rutherford, Creole; Newlon Reeves, Lake Charles; Daniel Roux, Cameron; and Tom Dewey, Merryville. 3rd Row—Oscar Strother, Elizabeth; Clifton Elmore, Kinder; and Louis LeLeux, Jennings. Missing—M.



District VI: 1st Row—Alfred J. Ouillion, Plaquemine; Honore Tate, Lawtell; Robert Romero, St. Martinville; Lester Hebert (V), Crowley; Melvin Dupuis, Breaux Bridge; Hyrum L. Martin, Washington; Noice Begnaud, Carencro; Harry J. Webber, Maringouin; Jennings Lemoine (V), Ville Platte; and Vincent Purpera, Jr., Innis. 2nd Row—Jos. Saia, Port Allen; E. J. Cormier, Lafayette; Kern Broussard (V), Erath; Russel Landry, St. Martinville; Sterling Hebert, Plaquemine; Leon Altazan, Port Allen; Elmo Torres, Maringouin; Regile Doucet, Washington; Wilfred Bonaventure, Oscar; Clinton Hebert, White Castle; and Chas. Ventrella, Batchelor. 3rd Row—Anthony Cashiola, Port Allen; Guy F. Hays (V), Reddel; Walter Rambo (V), Abbeville; Vincent Darby, Arnaudville; Donald Miller (V), Abbeville; Hubert Humphrey, Innis; James Spruill, New Roads; Coleman Fontenot, Eunice; Joseph A. Andrus (V), Ville Platte; Hugh W. O'Pry (V), Pine Prairie; George Hoffman, Grosse Tete; Alcide Dupre, Cecilia; Ivy Hanks (V), Morse; and Clyde LaCroix, Rayne.



District VII: 1st Row—Ben A. Price, Ethel, La.; Huey Bardwell, Ponchatoula; Lloyd Smith, Livingston; Henry Breeland, Pine Grove; James Singleton, Baton Rouge; Ernest Dillon, Kentwood; A. D. Parker, Covington. 2nd Row—Leroy Seal, Varnado; George Bunch, Clinton; Clyde Harvey, St. Francisville; Thomas Kemp, Franklinton; Arthur Jenkins, Covington; Charles Harris, Denham Springs; Levert Strahan, Franklinton; I. Coburn Hood, Baton Rouge. 3rd Row—Paul Littlefield, Clinton; Harold Schexnayder, Sorrento; Joseph Rosenthal, St. Francisville; Percy Easterly, Denham Springs; E. J. Milton, Tangipahoa; Prestley Mack, Hammond; Jesse M. Sanders, Kentwood; Nick Nichaus, Ponchatoula; Allen C. Jones, Corbin. 4th Row—Roscoe Brecheen, Greensburg; and Granville McCoy, Amite.



District VIII: 1st Row—Irvin Dares, Metairie; Joe L. Billiot, Metairie; Albert Camus, Algiers. 2nd Row—Alex Coulon, Barataria; Earl Gorio, Garyville; Frank Trocchiano, New Orleans; Samuel Nunez, Reggio; Emerson Ranson, New Orleans. 3rd Row—Chas. Miller, Marrero; Maurice Jeanfreau, St. Bernard; Emile Perez, Alluvial City; Frank Reno, Manchac; Robert Pertuis, Lutchet; (Missing) James Cavalier, Metairie.



District VIII: 1st Row—Peter Legnon, Houma; Ray Montet, Des Allemands; Earl Adams, Lockport; Lloyd Songe, Larose; Chris Acosta, Morgan City. 2nd Row—I. Coburn Hood, Baton Rouge; Cullen J. Landry, Paincourtville; Aubrey Nini, Berwick. 3rd Row—Sterling Landry, Belle Rose; Ulepsee Ongel, Cut Off; Mark Granier, Vacherie; Frank Tracchiano, New Orleans; Lesma Hebert, Labadieville; (Missing) James Jaccuzzo, Houma.



District VIII: 1st Row—I. Coburn Hood, Baton Rouge. 2nd Row—Gilmand Landry, New Iberia; Huey Ashley, Franklin. 3rd Row—Ted Bonin, Avery Island; Frank Tracchiano, New Orleans; Lesma Hebert, Labadieville; Joseph Waguespack, New Iberia.

FINES COLLECTED IN STATE AND FEDERAL COURTS

	1964		1965	
	State	Federal	State	Federal
Acadia	\$ 50.00	\$.....	\$ 142.00	\$.....
Allen	495.00	50.00	270.00	.....
Ascension	335.50	.....	1,565.00	.....
Assumption	50.00	.....	362.50	.....
Avoyelles	86.50	.....	10.00	.....
Beauregard .....	.....	.....	.....	.....
Bienville	80.00	.....	.....	.....
Bossier	285.00	.....	250.00	.....
Caddo	680.00	.....	1,705.00	.....
Calcasieu	30.00	650.00	50.00	1,150.00
Caldwell	115.00	1,535.00	716.00	3,100.00
Cameron	575.00	.....	1,150.00	.....
Catahoula	735.00	.....	2,435.00	.....
Claiborne	597.00	33.00	670.00	.....
Concordia	330.00	.....	665.00	.....
DeSoto	4,528.00	.....	1,294.00	.....
E. Baton Rouge	909.50	50.00	1,076.00	.....
E. Carroll	225.00	370.00	42.50	250.00
E. Feliciana	500.00	.....	1,125.00	.....
Evangeline	365.00	.....	455.00	.....
Franklin	322.50	.....	120.00	.....
Grant	1,391.00	.....	1,158.00	.....
Iberia	13.50	.....	472.00	.....
Iberville	650.00	.....	1,117.00	.....
Jackson	1,624.00	.....	3,554.00	.....
Jeff. Davis	75.00	25.00	477.00	.....
Jefferson	580.00	.....	385.50	100.00
Lafayette .....	.....	.....	.....	.....
Lafourche	95.00	4,600.00	332.00	1,905.00
LaSalle	75.00	.....	79.00	175.00
Lincoln	454.00	.....	447.00	.....
Livingston	321.00	.....	37.50	.....
Madison	285.00	.....	68.00	.....
Morehouse	1,237.50	.....	1,038.50	.....
Natchitoches	1,345.00	.....	817.50	.....
Orleans	390.00	.....	995.00	.....
Ouachita .....	.....	2,730.00	10.00	2,105.00
Plaquemines	230.00	325.00	479.50	700.00
Pointe Coupee	600.00	100.00	.....	.....
Rapides	1,050.00	.....	1,415.00	.....
Red River	125.00	1,900.00	491.50	710.00
Richland	50.00	.....	298.50	.....
Sabine	2,580.00	.....	5,232.50	.....
St. Bernard	303.00	.....	226.00	.....
St. Charles	1,580.00	.....	475.00	.....
St. Helena	290.00	.....	186.00	.....
St. James	150.00	.....	137.50	.....
St. John the Baptist .....	.....	.....	196.00	.....
St. Landry .....	.....	.....	.....	.....
St. Landry	340.00	835.00	790.00	.....
St. Martin	340.00	.....	1,585.00	.....
St. Mary	583.00	.....	409.50	.....
St. Tammany	2,188.00	.....	2,062.50	.....
Tangipahoa	512.00	.....	221.50	.....
Tensas	4,558.50	.....	3,311.00	.....
Terrebonne	7,497.60	.....	230.00	.....
Union	273.00	.....	382.00	.....
Vermilion	380.00	.....	.....	.....
Vernon	110.00	.....	92.50	.....
Washington	325.00	.....	50.00	.....
Webster	248.00	.....	75.00	.....
W. Baton Rouge	75.00	.....	1,600.00	.....
W. Carroll	75.00	.....	95.00	.....
W. Feliciana	400.00	.....	75.00	.....
Winn	125.00	.....	75.00	.....
TOTALS	\$44,743.60	\$13,003.00	\$45,333.50	\$10,195.00

CASES BY PARISHES

	1964	1965
Acadia	19	9
Allen	46	43
Ascension	77	94
Assumption	37	45
Avoyelles	47	44
Beauregard	17	43
Bienville	18	31
Bossier	22	18
Caddo	13	8
Calcasieu	91	99
Caldwell	21	57
Cameron	100	113
Catahoula	34	31
Claiborne	16	16
Concordia	69	79
DeSoto	48	28
E. Baton Rouge	27	31
E. Carroll	7	15
E. Feliciana	14	30
Evangeline	59	32
Franklin	61	46
Grant	11	33
Iberia	111	116
Iberville	229	408
Jackson	2	16
Jefferson	108	131
Jeff. Davis	35	35
Lafayette	35	24
Lafourche	209	202
LaSalle	20	36
Lincoln	19	14
Livingston	100	88
Madison	63	47
Morehouse	57	41
Natchitoches	34	108
Orleans	150	74
Ouachita	21	38
Plaquemines	76	44
Pointe Coupee	199	231
Rapides	16	72
Red River	11	9
Richland	92	113
Sabine	14	14
St. Bernard	188	132
St. Charles	110	85
St. Helena	19	24
St. James	31	16
St. John the Baptist	58	54
St. Landry	109	109
St. Martin	161	143
St. Mary	69	54
St. Tammany	156	381
Tangipahoa	83	106
Tensas	110	53
Terrebonne	201	122
Union	14	19
Vermilion	75	45
Vernon	25	33
Washington	33	66
Webster	25	9
W. Baton Rouge	51	69
W. Carroll	12	6
W. Feliciana	8	1
Winn	7	6
	4,000	4,342
	436	963
	3,564	3,379

MOTORBOAT VIOLATIONS

Water Skiing w/one person in boat	8	23
Operating m/b reckless	6	8
Operating m/b no lights	13	19
Operating m/b unregistered	133	338
Operating m/b no life preservers	276	610
TOTALS	436	963
	3,564	3,379
	4,000	4,342

FINES

	1964	1965
Jail Sentence	49	20
Jail Sentences Suspended	15	19
Nolle Pross	177	270
Prosecution Declined	13	34
Not Guilty	19	27
Fine Suspended	40	42
Minor	26	16
On Probation	7	4
Case Dismissed	44	22
License Revoked 1 yr.	7	11

	1964	1965
Fines collected		
in District Court	\$44,743.60	\$45,333.50
Fines collected		
in Federal Court	\$13,003.00	\$10,195.00

TYPE OF VIOLATIONS

	1964	1965
Angling without non-res. lic.	27	21
Angling without license	882	1086
Commercial fishing without lic.	92	48
Selling turtles without lic.		0
Selling crabs without lic.		0
Selling fish without lic.	23	20
Poisoning fish		0
Electrocution of fish	20	17
Fishing game fish illegal tackle	69	66
Fishing with explosives		0
Commercial fishing in closed waters	1	0
Trawling without license	85	38
Trawling without permit		0
Trawling with net over 50 feet		0
Trawling with double trawl	2	0
Trawling for crabs		0
Trawling illegal trawl	1	0
Trawling in sanctuary	8	0
Seining in Sanctuary	6	2
Trawling in closed waters	54	25
Trawling at night		2
Seining in closed waters		7
Possession of undersize fish	121	93
Possession of over limit game fish	3	5
Possession undersize shrimp	46	5
Possession game fish for sale	1	8
Possession of undersize crabs		0
Blocking stream	17	20
Illegal taking oyster (bedding ground) ..	1	0
No oyster license and/or tags	18	0
Pollution of stream		0
Hunting without license	222	196
Possession wild ducks	3	1
Possession of over limit mig. waterfowl ..	67	78
Hunting mig. waterfowl illegal hour	102	57
Selling migratory waterfowl	5	0
Hunting mig. waterfowl in close season ..	100	129
Hunting mig. waterfowl with no stamp ..	35	27
Hunting mig. waterfowl in baited pond ..	6	7
Hunting from power boat	51	49
Hunting doves closed season	27	7
Hunting doves in baited field	10	18
Possession of over limit doves	7	10
Hunting with unplugged gun	86	68
Hunting on State preserve	28	92
Hunting at night	534	494
Hunting & killing over limit wood duck ..	2	0
Hunting & killing woodduck close season ..	10	5
Hunting quail in close season	7	5
Hunting snipe in close season	8	0
Hunting & killing grobec	21	5
Hunting rails in close season	4	5
Hunting & killing cranes	7	4
Hunting & killing robins	1	12
Hunting & killing heron	8	6
Hunting woodcocks in close season	4	3

TYPE OF VIOLATIONS

	1964	1965
Hunting woodcocks illegal hours	0	0
Hunting without a non-resident lic.	1	4
Hunting frogs illegal gig	58	4
Possessing frogs in close season	11	0
Hunting frogs in close season	10	49
Hunting frogs with gun	8	8
Hunting squirrel in close season	82	79
Selling squirrel	0	0
Possession over limit squirrels	0	0
Possession illegal killed rabbits	3	0
Possession over limit rabbits	0	1
Hunting rabbits in close season	23	56
Selling rabbits	11	4
Killing doe deer	71	68
Possession of illegal deer	50	27
Hunting deer in closed season	99	80
Hunting deer in close parish	12	5
Hunting deer no tag	70	26
Hunting turkey in close season	9	11
Hunting & killing hen turkey	6	0
Hunting turkey no tag	2	1
Hunting turkey over baited area	1	0
Hunting on public road	3	11
Hunting fur bearing animal with gun	4	6
Trapping without license	10	7
Trapping out of season	4	3
Trapping on State Preserve	0	2
Buying furs w/o lic.	3	1
Taking alligators in close season	37	45
Possessing undersize alligators	0	5
Camping on Refuge	46	0
Setting fire on State Park	0	0
Operating hunting club no lic.	4	0
Resisting arrest	4	7
Failing to return permit on specified time .	0	0
Water skier with 1 person in boat	8	23
Operating motorboat—reckless	6	8
Operating motorboat—no lights	13	19
Operating motorboat—unregistered	133	303
Operating motorboat—insufficient L/S/D .	2	0
Hunting killdeer in closed season	0	0
Operating boat no fire extinguishers	0	0
Trespassing on Refuge with fire arms	46	74
Hunting off of Federal Hwy.	0	0
Hunting off of State Hwy.	11	26
Possession undersize oysters	0	0
Parole violations	0	0
Operating M.B. no life preservers	274	610
Trespassing on Refuge	16	4
Hunting doves illegal hour	1	9
Killing bear closed season	3	1
R. Deer Dogs Still Area	12	0
Operating m/b w/expired numbers	..	35
	4,000	4,342
	436	963
	3,564	3,379
Transporting ducks untagged		5
Overlimit teal		8
No teal permit		10
Taking nutria at night		8

Fur Division

LOUISIANA'S FUR INDUSTRY enjoyed the two most active and profitable years during this biennium than it has had in the past decade. The results of the Division's research in developing the new "long hair" nutria pelt has been more than gratifying. In fact, there is a slight feeling at this time that the trade may over price the new fur, tending to hurt or dampen its future as is often the case in this industry.

Louisiana nutria has not only gained acceptance in the broad international fur trade as a "long hair" fur, but the finer western Louisiana pelts that are used in the plucked and sheared state for coats are also in increasing demand.

This has been the first period in the history of Louisiana's fur industry when the trappers, buyers and dealers think exclusively in terms of nutria and not muskrats.

However, the Commission has approved a comprehensive expansion program for the Fur Division that is designed to reach all facets of the State's fur industry, bringing its annual economy back to the normal five to eight million income to the trappers and operators.

The value of Louisiana fur and meat products produced by trappers during the 1964-65 season shows a substantial increase over any of the previous thirteen seasons. The \$4,097,537 dollar value recorded for the past season's catch has not been topped since the 1950-51 season. When the crop was valued at \$5,957,247.54, that season 2,477,464 Muskrats, 184,552 Minks and 104,420 Raccoons were trapped.

It is true that the catch of Raccoon, Opossum, Fox, Beaver and Lynx would be much greater if only the price per pelt could be raised to a point allowing the "upland trapper" the equivalent of a day's wages for pursuing these furbearers, for populations of these species are high.

Muskrats are on the increase in a number of areas throughout the coastal marshes, and in most instances landowners and operators made an effort to trap Muskrat on their particular marshes, very lightly or not at all. It is thought that 30 percent more Muskrats could have been taken during the 1964-65 season had the trapper made a special effort to trap this furbearer, long known to be the backbone of the state's fur industry.



TED O'NEIL

Figures for the 1965-66 season will not be completed until June, however, the trend is following much along the same lines as 1964-65 statistics except for 65% increase in the price of Nutria and 50% on Raccoon.



The demand for the "red muscle tissue" of Nutria meat has played an important role in the development of the State's fur industry.

LOUISIANA COMPARATIVE FUR TAKES 1964-1965 AND 1963-1964 SEASONS

	<i>Muskrat</i>	<i>Nutria</i>	<i>Opossum</i>	<i>Raccoon</i>	<i>Mink</i>	<i>Skunk</i>	<i>Otter</i>	<i>Lynx</i>	<i>Fox</i>	<i>Beaver</i>
1964-1965	201,510	1,568,233	7,047	68,627	23,311	296	3,288	31	145	57
1963-1964	240,079	1,304,267	7,593	58,424	18,805	301	4,274	26	139	25
Increase		263,966	....	10,202	4,506	...	....	5	6	32
Decrease	38,569	.....	546			5	986			
% Increase		20.2%		17.4%	23.9%			19.2%	4.3%	128.0%
% Decrease	16.1%		7.2%			1.7%	23.1%			

FUR PROJECT I Coastal Type-Map

Objective:

1. To determine changes and possible losses of suitable fur animal habitat over the past 20 years.

Reasons for Undertaking Work:

1. To determine what factor brought about a change, if any.
2. To estimate possible fur animal production for the future, principally muskrat.
3. To pinpoint detrimental practices used by industry which may easily be diverted or controlled to producing edaphic conditions advantageous to fur production.

FUR PROJECT II

A Statistical Study of Fur Animals with Reference to Takes, Methods and Practices

Objective:

1. To determine just what has occurred in the way of fur animal catches by species on a given tract of particular type marsh since the advent of nutria and extreme industrialization.
2. To determine changes in methods of management and trapping.



A trailer load of raw Nutria on the way to a processing plant, a sight not uncommon along the South Louisiana highways.

Reasons for Undertaking Work:

1. Fur animal catches, marsh management technique and trapping methods have changed considerably in the past ten years.
2. If there are marked differences in management that has proved more productive under present prevailing conditions this should be known and publicized.

FUR PROJECT III

An Epidemiological Study of Diseases and Parasites

Objective:

1. To determine what part, if any, disease and parasites have had in fur population fluctuation.
2. To determine if furbearers have any disease or parasites that might be transmitted to man or other animals.
3. To determine if the meat of nutria, raccoon, opossum or beaver, may carry certain parasites or viruses that may be transmitted to man or other animals.
4. To determine what set of marsh or swamp conditions must prevail to complete the life cycle of certain parasites or diseases that may be found, if any.

Reasons for Undertaking this Work:

1. 10,000,000 lbs. of nutria meat is presently handled and sold in the raw frozen state to mink ranchers and pet food manufacturers throughout the United States annually.
2. 300,000 to 400,000 lbs. of raccoon and opossum meat is handled and sold for human consumption annually.
3. Nutria meat may eventually be sold for human consumption.
4. In addition to the 4,000 to 5,000 persons directly related to the trapping business, the entire Gulf Coast area population is subject to contact with the various animals found inhabiting the marshes, swamps and water bottoms.
5. Many European countries that use our furs require a certificate indicating that the furs shipped in are free of transmittable diseases.

FUR PROJECT IV

Study of Species Competition

Objective:

1. To determine what effects the nutria has had upon the resident furbearers, particularly the muskrat.
2. To determine the relationship between the mink, otter, raccoon, muskrat and nutria under different types of habitats, particularly the deep cypress-tupelo gum swamps.



In the past two years Muskrats have indicated that they are on the increase. Muskrats have never indicated that human activity has had any affect upon their well-being, as long as the habitat is not disturbed.

Reason for Undertaking Work:

1. Previous observations have indicated that much strife has occurred between the muskrat and nutria.
2. Pelt cuts and scars have indicated that the nutria fought viciously with the mink and otter upon the nutria's original spread into a new territory, however, within a couple of years there was little or no evidence of such strife between these species.
3. Catch records indicate that muskrat, nutria, mink and raccoon populations have remained stable for many years throughout the rice belt of southwest Louisiana, indicating no sign of strife.
4. Catch records on certain deep cypress-tupelo swamp habitats have indicated that neither muskrat or nutria are able to survive a high mink population.
5. Indications that food consumption on the part of the nutria has been one of the primary factors limiting muskrat populations.

FUR PROJECT V

An Investigation of the Part Played by General Industrialization of the Coastal Areas with its Disturbance and Accompanying Pollution

Objective:

1. To determine more specifically what effect industrialization has had upon the State's furbearing animals and their habitat.

Reason for Undertaking Work:

1. Since the advent of unprecedented industrial development in Louisiana, there has been a steady decline in certain fur animal

populations, particularly the muskrat.

2. Such a study may assist in evaluating the effect pesticides have played upon other forms of animal life so valuable to Louisiana.
3. It is thought that certain practices of industry and agriculture may be converted advantageously to wildlife, possibly without additional costs.

FUR PROJECT VI

A Study of the Fur Market and its Relation to the Demand for Louisiana Furs

Objective:

1. To determine if it would not be advisable for Louisiana to advance from the present fur buyer-dealer type of raw fur business alone, and make an effort to bring a larger part of the total economy to the State.
 - a. Examine the feasibility of fur dressing and manufacturing locally.
 - b. Determine the value of designing and promoting certain styles made up primarily from our lagging furs such as raccoon, opossum, bobcat and nutria.

Reasons for Undertaking Work:

1. At present Louisiana participates in only an estimated 20% of its fur industry.
2. European and New York dealers purchase,



Nutria pelting is increasing the job opportunity all along the coastal marshes.

process, and manufacture all of the raw furs produced in Louisiana. The out-of-state dealers naturally have little interest in the welfare of our trappers and producers. Upon numerous occasions certain of our furs are allowed to go unmoved. Such is the case at present with raccoon, opossum and Louisiana beaver.

FUR PROJECT VII

Publish Comprehensive Mammal Book

Objective:

1. To publish a comprehensive work covering each of the furred mammals of Louisiana.

Reason for Undertaking Work:

1. There has never been a book published on Louisiana mammals.
2. A must for educational work in collaboration with the Louisiana School Conservative Program.

FUR PROJECT VIII

A Comprehensive Alligator Study with Emphasis on Management in the Wild and Controlled Farming

Objective:

1. To develop a worthwhile income to the State from the valuable natural resource.
2. To determine seasons, methods and size to be harvested.
3. To determine feasibility of licensing hunter, tagging and taxing hides.
4. To make a study of success and failure in alligator farming.
5. To determine feasibility of setting prices on live breeding stock for farming purposes.
6. To give the alligator a better image in the eyes of the general public.

FUR PROJECT IX

Fur Storage Warehouse

Objective:

1. To renovate the Commission's Fur Auction

The alligator needs more protection, management and Legislation.



Proper burning is a MUST for the management of coastal marshes for fur production.

Warehouse located in Abbeville.

Reasons for Undertaking Work:

1. To store, handle and auction furs trapped on State owned refuges.
2. Warehouse serves as storage for Commission's equipment during off-season of furs.
3. Will serve as field office.

TRAPPING AND BURNING PROGRAM FOR THE STATE OWNED COASTAL REFUGES

A cooperative fur management program between the Refuge & Fur Division has been approved by the Commission and gotten under way.

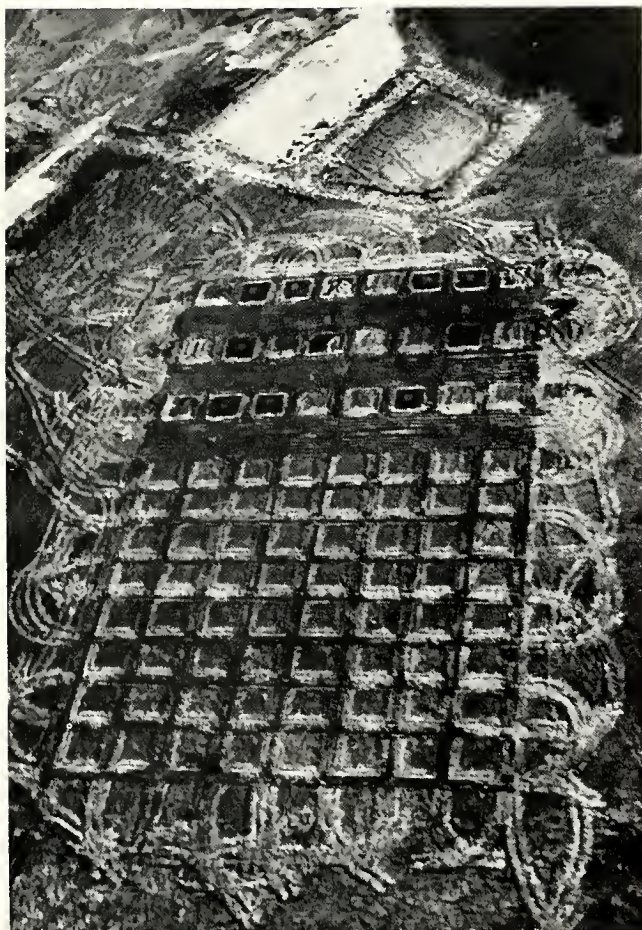
The three Coastal Refuges, Marsh Island, State Wildlife & Fisheries & Rockefeller and the state-owned Pass A Loutre, a public hunting ground representing three different types of Marsh conditions and habitat, Marsh Island and State Wildlife, being much the same in make-up.

Marsh Island and State Wildlife

The geographical composition of Marsh Island and State Wildlife Refuge is similar, and management on these two areas can be patterned along the same lines. Both Refuges are older, sub-delta type peat marshes, bordering on Vermilion Bay which acts as a mixing bowl for fresh and salt water, creating a settling-out basin where marine and river silts are precipitated to a great extent. This is known to be the basic prerequisite necessary to produce three-corner grass (*Scirpus olneyi*) on a large scale, the type vegetation that has been responsible for 80% of the State's muskrat production.

Rockefeller Refuge

The Rockefeller Refuge is of recent origin, not over 700 years of age, the oldest part being along the Grand Chenier Ridge. It is well within the prairie type marsh habitat of west Vermilion and east Cameron parishes and presents a com-



Experimental plot located in the Price Lake Area of the Rockefeller Refuge. Various chemicals and management practices are being analyzed by the Louisiana Cooperative Wildlife Research Unit, Louisiana State University, Game Management School, and the Refuge Division. Information gained from this research will be used to improve marsh conditions for fur bearing animals and waterfowl on the refuge areas as well as on private land.

pletely different set of conditions. In fact, the Rockefeller Refuge is an area all of its own and not represented on a large scale anywhere else along the Gulf Coast, since this strip of marsh lacks protection from a high barrier beach fronting on the Gulf as does the other areas along the western Louisiana coast. The absence of a firm gulf beach has allowed the development of six major bayous, all heading up and being encompassed within the refuge proper, and opening directly into the Gulf. These marshes are subject to the most severe conditions, allowing only a few spots that may be conducive to the bayonetted type three-corner grass (*Scirpus olneyi*).

Rockefeller Refuge is excluded from the category of delicate edaphic conditions known to produce *olneyi* over large expanses due to the absence of the mixing bowl effect afforded by Vermilion Bay in the case of Marsh Island and State Wildlife Refuge.

During most of the year the portion of the Refuge lying outside of the man-made impoundments is subject to daily tide fluctuation and each incoming tide is heavily laden with raw marine silt with salinities up to 80% sea-water. Therefore, a fur management program for Rockefeller must be designed to produce "Coco", a leafy three-corner grass (*Scirpus robustus*) which is very desirable for both muskrats and waterfowl. "Coco" produces an abundant seed crop used by ducks, particularly mallards, and a tuber and stalk rich with sugars and starch used by geese and muskrats.

Pass A Loutre

The Pass A Loutre Preserve, being an active delta represents practically all other conditions not found on any of the three other Refuges. Pass A Loutre marsh conditions are dependent upon the spring stages of the Mississippi River, which, of course, are subject to the amount of rainfall and snow on the headwaters. Fresh water conditions prevail on the delta during the early spring and summer growing season which produces primarily fresh to slightly brackish marsh species of vegetation; alligator grass (*Alternanthera philoxeroides*), cattail, broad and narrow leaf (*Typha latifolia* and *lanceifolia*), fresh water three-corner grass (*Scirpus americanus*), delta duck potato (*Sagittaria platyphylla*), dog-tooth grass (*Panicum repens*), roseau cane (*Phragmites communis*) and a number of the pond weeds used by nutria.

Management for furbearers on the active Mississippi River Delta is, for the most part, beyond the control of man's manipulation devices, particularly the use of burning.

BASIC MANAGEMENT INFORMATION

Before a management plan is outlined for the refuges, it should be mentioned that each area

is located within a range of certain possibilities and endeavoring to step beyond such possibilities has proved, thus far, economically unsound and a waste of time and effort. Although operating well within the limitations of a given marsh area, there is no guarantee of 100% success. Weather conditions may work against a planned management program even to the point of reversing desired marsh conditions. Droughts and prevailing westerly winds are known to produce abnormal low tides, resulting in salinities above the tolerance of the plant species that the program is designed to produce. Storms may occur, also upsetting a program that is well underway, retarding progress for indefinite periods.

There are still many unknown factors that may adversely affect a management program. For instance, little is known about marsh plant diseases and parasites. The known cyclic nature of marsh animal species must be considered. The relationship between the various animals occupying the same area needs more study, particularly the relationship between the muskrat and the nutria.

Apparently the occurrence of prolonged rainy cycles are of vital importance to the production of three-corner grass and great muskrat populations on the Louisiana coast. Records indicate that peak productions coincide with abnormal rainy cycles.

On the recent aerial survey of the existing muskrat population, it was observed that the only healthy muskrat colonies with large, well-worked houses was confined to three-corner grass stands with dark, green-to-purple hue. The light green grass with a yellow hue contained practically no nests. In the past when muskrat populations flourished in our marshes, three-corner grass was easily spotted from the air by the decided purple hue, but today an observer must look more closely as the light hues of *olneyi* in our marshes does not stand out greatly from the other grasses.

Both State Wildlife and Marsh Island Refuges presented outstanding examples of the lighter colored three-corner grass and yellow-dry muskrat nests, whereas Cypremort Point marshes located on the north shore of Vermilion Bay just eight miles from Marsh Island carried solid stands of the purple three-corner grass and produced 30,000 muskrats during the 1963-64 season and 60,000 muskrats during the 1964-65 season. Catch records were checked occasionally for the past two seasons on Cypremort Point and it was not unusual for a trapper and his helper to make a catch of 75 muskrats and 35 nutria in the same day, indicating that the nutria may not be as great a factor as many are inclined to believe.

During the past two years, 4,000 to 5,000 acres were required for a trapper to take 35 nutria on a single run on either Marsh Island, State

Wildlife or Rockefeller Refuges, definitely indicating that the nutria population is much lower on the Refuges than on the Cypremort Point marshes.

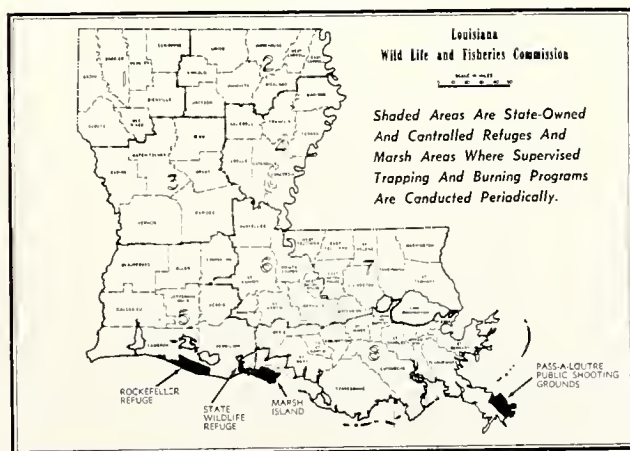
BURNING

Proper burning for the production of three-corner grass depends to a great extent upon the individual. Numerous examples can be cited where certain managers have invariably been successful at producing a three-corner grass marsh, whereas, an adjoining operator has failed.

Basic Factors Pertaining to three-corner grass (*Scirpus olneyi* and *robustus*), Wiregrass (*Spartina patens*) and Associates

1. Three-corner grass (*olneyi*) is a subdominate species that will occupy only the marsh area adjacent to or related to coastal estuaries serving as a mixing bowl, tending to produce brackish water reasonably absent of marine deposits.
2. *Olneyi* is a poor competitor and cannot compete with the more tolerant and versatile species of vegetation, particularly wiregrass (*patens*), which occupies the same set of edaphic conditions as does *olneyi*. *Patens* has a greater tolerance to salinity, soil make up and minus (—) water levels.
3. Annual burning is necessary in order to prevent other species from crowding out three-corner grass.
4. *Olneyi* grows year round, as does wiregrass (*patens*). The only advantage that a manager has in establishing stands of three-corner is that *olneyi*'s deeper system of viable roots give it a decided advantage in starting new growth immediately following proper burns, especially so when (+) water level conditions occur immediately after burning.

The viable joint nodes and shallow root systems of wiregrass tends to put this species at a distinct disadvantage by proper burning.



**Broad, basic rules to be followed when
managing mixed stands of three-corner
grass (*Scirpus olneyi*) and wiregrass
(*Spartina patens*)**

1. Burning can be done any time from September through January, preferably October and November. An effort should be made to catch marsh conditions dry enough so that the wiregrass will be burned to a low stubble.
2. Burning should be done prior to the rising tides produced by a full or growing moon.
3. Over-all weather conditions should be observed closely and every effort made to burn just prior to heavy rainfall which produces (+) water levels with reduced salinities.
4. There are extremes, ranging in both directions from mixed stands of three-corner grass and wiregrass. *Solid stands of three-corner grass should be burned in October or November with low (+) water levels prevailing but never under drought conditions.* On the other hand, great wiregrass "roughs" with occasional sprigs of three-corner grass coming through should be allowed to remain until enough litter has accumulated, forcing reproduction of the wiregrass from stalk nodes, tending to further elevate the level of the root system. Burning should then be done under extreme dry conditions, with the anticipation of flooding immediately. Here again a close watch on weather conditions is necessary.
5. Three-corner grass will reproduce from seed only under unique conditions. Occasionally in muskrat or goose eatouts, the marsh floor is churned to a mass of floaty-ooze and is bouyed by the gases formed underneath, elevating the marsh floor, allowing exposure and drying. Germination of the seed then result.

Leafy-Three-corner grass, or "Coco"

1. Leafy three-corner grass or "coco" occupies marsh conditions that are subject to marine deposits. The salinity range of coco is somewhat greater than that of *olneyi*. Coco reproduces from the viable root systems and also more readily from seed than does *olneyi*.
Solid stands of coco may be produced from seed germinating when the floor of shallow ponds and scalded-out areas of marsh have become exposed. Reproduction from seed readily occur in eat-outs as described in the case of *olneyi*.
2. Coco will reach maturity in late spring and early summer and will not continue to grow

and reproduce another seed crop until the following spring. Winter weather conditions tend to retard the maturing of coco to a much greater extent than either *olneyi* or wiregrass.

3. Burning for the production of coco should be done from November through March and even April, although later burning tends to destroy the nests of birds and young marsh animals.
4. The same principle of observing the weather and endeavoring to burn under drying conditions, preceding flooding tends to produce coco and retard wiregrass in the same manner as it does in the case of *olneyi*. Here again, if coco areas are left unburned they will readily revert back to wiregrass.
5. Stands of wiregrass with sprigs of "coco" grass scattered about may be dry-burned for years, and unless a scalding out by flooding occurs within a few days after the burn, the end result will again be wiregrass.

RECOMMENDATIONS

Marsh Island and State Wildlife Refuge

1. Divide Marsh Island in four or five separate tracts, making certain that individuals are responsible for the proper burning of each tract:
 - a. Work with the Refuge Supervisor and the Managers appointed to each tract, explaining the ecological data in this report that pertains to three-corner grass, wiregrass management, so that they will have a better understanding of why burning accomplishes certain changes in vegetation make-up.
 - b. Start the burning program in September and finish by early January, allowing all of the new vegetative growth ample time to mature before the following fall.
 - c. Routine aerial reconnaissance will assist the burning manager.
 - d. Live-trap and transplant 500 Muskrats to suitable areas on the Island during October and November of 1965 and 1,000 during March, April and May of 1966.
2. Make an effort to place at least five well equipped trappers on the Refuge before January 1966.
 - a. Encourage the trapping of raccoon, mink and nutria on a 90%-10% basis the first season.
 - b. Access should be developed for trappers in inaccessible areas.

State Wildlife Refuge

1. It is not necessary to divide this Refuge for burning supervision due to its smaller acreage.
 - a. The personnel on this Refuge has always had a particular interest in burning. The present condition of the vegetation bears this out in that three-corner grass is well established in most suitable areas.
 - b. Assistance should be given in the basic ecology as explained in this report.
 - c. The burning schedule should follow as outlined for Marsh Island.
 - d. Stocking with muskrats is not necessary as there is ample seed stock on the Refuge at present.
2. At least three well equipped trappers should be employed for nutria, mink and raccoon, trapping on a 90%-10% basis.
 - a. Ditches should be plowed to facilitate getting the Nutria out of inaccessible areas, but do not cut into tide action at any point.

Muskrat Experimental Area

A 10,000 acre experimental area was selected on Rockefeller Refuge. The acres selected encompasses the superior oil field and canal. Such a selection was made in a unique situation where use may be made of fresh water from the Mermen-tau basin through the superior canal and salt water is available through big and little Con-stance bayous leading into the Gulf; with only six miles of low levee improvement and 10-3 foot water control Flap Gates. The entire 10,000 acres may be managed for vegetation and Muskrat studies.

Pen-Rearing of Mutation Nutria

Two experimental mutation Nutria ranches have been set-up in South Louisiana, the first on Mrs. Maple Hughes' ranch, located in Lake Arthur, Louisiana and the other in Eunice, Louisiana.

At this early date, the Fur Division can see merit and possibility of successful ranching of mutation Nutria in the South, but many basic obstacles must first be ironed out, which takes experimenting, time and money.

More intensive study of this venture is planned by the Fur Division following this immediate fur season.

Nutria Meat for Human Consumption

Eight to ten million pounds of wild Nutria meat produced annually by the State's trappers and operators is apparently, more than ever in demand by the Northern Mink ranchers. All "red muscle tissue" is becoming scarce worldwide and more expensive.

Considerable work was done by the Division during the past two years, with the Federal and State Pure Food and Drug Departments, searching out various avenues that may lead to the marketing Nutria meat for human consumption. When this is accomplished, the value of the Nutria will be greatly enhanced.

Closed Trapping Areas

Closure of the 1965-66 trapping season in St. Bernard and that portion of Plaquemines Parish lying East of the Mississippi River extending Southerly to the Pointe-a-la-Hache boat channel. The area was closed to trapping at the request of the St. Bernard and Plaquemines Parish Police Jury.

Action took place before the devastating occurrence of storm "Betsy".

Even before the storm, there was a shortage of furbearers in this once most productive area of the State. Records show that 80% of the total State's catch of Muskrats was taken in these marshes in the 1926-27 season.

The thinking of the trapping interest in St. Bernard and Plaquemines Parishes was based on the fact that there was an estimated 70,000 Muskrats scattered throughout the expansive outer fringes of the Parishes, whereas the inside better three-corner grass marsh was practically absent of any furbearers. Past experiences had taught the trapping operators that a normal sixty to eighty miles per hour storm would tend to shove the Muskrat population to the more accessible inside marshes. The disturbance of the storm bringing in new silts and animals has always acted as a catalysis rejuvenating their industry, which has been dead since 1957. But, who would have expected a ten to sixteen foot tidal wave created by a hundred and fifty mile an hour wind, in fact, "Betsy" just over did it.

HURRICANE BETSY REPORT

1. St. Bernard, Plaquemines, and Orleans Parishes completely out as far as fur production is concerned for the 1965-66 season. Closure to trapping should be considered for areas other than those already closed in St. Bernard and Plaquemines Parish. Surveys along the North Shores of Lake Borgne and Mississippi Sound as far East as Biloxi revealed the story. The drifts extending out two to three hundred feet all along these beaches, counting thousands of dead mammals and birds. Apparently almost nothing survived the terrific beating that they were subjected to. The vegetation in the drifts, posted signs, skiffs and other items just about told what areas in Louisiana they originated from. Even the returning brown pelicans were destroyed. The only living species that were reported to have made the trip were a few otter and raccoons. Five deer carcasses were counted, undoubtedly there were many others.

The Deep Cypress *Tupelo gum* swamps that are known to produce 80% of the State's Mink crop and a large percentage of our raccoon was subjected to the full force of "Betsy". The green foliage in the sluggish swamp water has set up a rotting action destroying the aquatic life known to be the basic food supply of the mink and raccoon. Further damaging effects in this area were the loss of the mast crop and a large percentage of hollow nest trees. Falling trees and limbs are known to kill a large percentage of the birds and mammals depending upon the severity of the storm and "Betsy" apparently rated in the top bracket along these lines.

Experienced deep swamp trappers have little or no hope for making a season this winter, and are talking about keeping their jobs. Carpenter and construction work should be at an all time high for the next year in Southeast Louisiana.

Marshes westerly of Lafitte located in Jefferson Parish were not damaged by the storm-driven salt tides. The counter clockwise action

of "Betsy" created abnormally low tides in these coastal parishes. However, for the past five days, many of these areas are being subjected to abnormally high tides two to four feet above normal. This tide is being maintained by a steady ten to fifteen mile per hour easterly winds. Conditions of this type have been known to create a type of "botulism" in the marshes, more devastating to fur animal populations than storm tides.

Estimated losses are as follows:

Nutria	400,000
Mink	15,000
Muskrat	70,000
Otter	1,000
Raccoon	40,000

MUSKRAT RESTOCKING

Fifteen hundred Muskrats were live trapped and transplanted to suitable habitat for experimental purposes. Results thus far have been gratifying.

Fish and Game Division

WILDLIFE MANAGEMENT may be defined as the art of making land and water produce sustained annual crops of wild game and fish for recreational, economical and aesthetic values. Thus, activities of this Division during the past biennium have been directed toward meeting the needs of the expanding population of hunters and fishermen from the standpoint of increasing the recreational, economical and aesthetic values.

It is the aim and duty of every employee of this Division to produce, protect and maintain the natural resources of our State. With the increasing fishing and hunting pressure caused by the growing number of sportsmen and other outdoor enthusiasts and ever increasing changes and destruction of the fish and game habitat, our job of furnishing satisfactory fishing and hunting is becoming more difficult.

Not only are the hunters increasing while suitable game range is being reduced, much of the remaining suitable and adequate range is being retained by the owners for leasing to private groups for private hunting areas where relatively few individuals may hunt. This further complicates the problem and restricts our sportsmen because much of the best areas are now in private hunting clubs.

Through research many of these problems can be solved. The Fish and Game Division currently has one of the best research staffs in the nation. Much of our research is now twenty years ahead of public acceptance. A good example of this is the killing of doe deer to thin over populated herds and keep these herds in balance with the range.

Louisiana is leading in many phases of fish and game research. Our state biologists were the first to experiment with the use of oral tranquilizers on wild game populations and one of the first states to use the tranquilizer gun (CO₂ air rifle designed to shoot a hypodermic syringe) some years back. However, the oral tranquilizers are now being used more efficiently for our purposes. We have the most extensive squirrel study in the nation being conducted on our Thistlethwaite Wildlife Management Area.

Presently, our mourning dove research is second to none. Population studies, banding and kill surveys are being conducted. A new method of kill results from sportsmen has been made



JOE L. HERRING
Chief

by telephone surveys, Louisiana being the first state to use this method. We are one of the leading states as to number of birds banded.

A program of deer trapping and transplanting has been conducted for several years in Louisiana. For years we depended only on the "box type" trap, but today deer are being caught by using airboats, airplanes, helicopters and tranquilizers. Deer have now been stocked in every section of the state and our hunting picture has changed. Fifteen years ago approximately twenty percent of our state was open for deer hunting, but now the picture has reversed. All but twenty percent is open for hunting.

Exotic bird studies are being conducted for the purpose of finding new species that may adapt themselves to our state. Two birds presently being worked with and show promise are the black francolins and junglefowl. Others are being studied.

Research is being conducted on catfish and bullfrogs. Louisiana has made much progress



KENNETH C. SMITH
Assistant Chief

along these lines. Catfish research for the purpose of pond production and sale has taken priority in our state.

Crawfish research has been conducted and will be put on a par with catfish research within the year. For commercial purposes biologists will find the answers for producing higher yields on smaller areas.

Two new species of fish being studied are walleye and striped bass. The new species of fish being studied are not to replace our native fish, but to fill areas that our fish do not utilize.

Hyacinth spray crews have made accessible thousands of additional water acres for fishermen. If we did not spray for this ever spreading and growing plant, our lakes would soon be covered to the point that they could not be utilized.

The Wildlife Management Area program under the Fish and Game Division supervision provides many sportsmen with a place to hunt. Each year the number of hunters on state management areas increases indicating the loss of other lands for these sportsmen. A balanced program is being conducted on these areas.

Through our District system the Fish and Game Division serves as an Extension Service to farmers, landowners and others interested in managing their lakes, ponds and lands for fish and game. Biologists are called on to prepare management plans or give technical advice on how to better manage private lands.

The Wildlife Education Section has expanded and is doing an excellent job in presenting the wildlife story of progress. This section primarily works in the schools, but presents programs to any group or organization requesting a wildlife program. This section also places displays at the various fairs, conventions and other gatherings so that the citizens of our state may be better informed of our wildlife resources.

During this Biennial the Fish and Game Division was moved to Baton Rouge from New Orleans. Two Divisions of the Commission now domicile in Baton Rouge.

Since moving to Baton Rouge activities of the Division have increased and better coordination of Districts and projects has been accomplished. There are many advantages of having the Division office in Baton Rouge rather than New Orleans. Some are as follows:

1. The Division is more centrally located in the state. Personnel from the main Division office can travel to various parts of the state and return the same day, thus not being out of the office for long periods. District personnel can come to the main Division office much more conveniently. One day trips, where in most cases it would be

two day trips to New Orleans and return from the Districts are now possible since the move. This is a considerable saving to the Commission and state.

2. This Division coordinates activities with other state agencies such as: Department of Public Works, State Highway Department, State Parks and Recreation Commission, State Department of Education, State Department of Agriculture, as well as others, being in Baton Rouge saves times in meeting with these agencies.
3. It is more convenient for the Legislators to visit the office while in Baton Rouge or to have our personnel meet with them. Legislators must come to Baton Rouge on legislative matters and other state business, thus making it convenient for Fish and Game personnel to meet with them while here on other business.
4. Activities with the Fisheries Research unit and Wildlife Research Unit at Louisiana State University can be coordinated more efficiently.

Moving this Division to the Capitol has been one of the greatest moves for wildlife in recent years.

The Fish and Game Division is divided into six major sections. Detailed reports on the various activities of this Division's sections follow this general and very brief introduction.

River Basin Section

MAX W. SUMMERS

Supervisor

Now, more than ever before, we must recognize the need for suitable habitat if we are going to keep and maintain our fish and wildlife resources. Native fish and game animals are products of water and land environments and are dependent on these natural areas for their continued growth, reproduction and actual survival. To reduce, destroy or otherwise alter our natural areas is to make serious inroads into future native game and fish populations.

If we are to continue to enjoy hunting and fishing as we do today, and if we are to maintain our commercial fishing and fur trapping industries for future years, we must protect and preserve essential native habitat. For without proper food, cover and breeding areas we can no longer expect game and fish populations to provide continued hunting and fishing opportunities.

We can little afford to gamble on these re-

sources taking care of themselves. It must be a joint effort of all to protect these natural assets if we are to leave our children with a first hand knowledge of these things we take for granted.

The Louisiana Wild Life and Fisheries Commission has for the past decade been actively engaged in a program of habitat preservation. This work has gone forward under the supervision of the River Basin Section since it was formed in 1955. From that time on it has been the purpose of this section to assume the responsibility to coordinate, investigate and evaluate all proposed projects that would in any way be detrimental to Louisiana's fish and wildlife resources.

As projects are planned and initiated, they are studied and reviewed by the River Basin Section. Upon completion of these studies, reports containing fish and wildlife recommendations are prepared and submitted to various agencies, governmental authorities and other interests associated with the project. Generally, all projects involving water control or use will have some effect on fish and game animals. However, in many instances project modifications can be incorporated into the plan which will minimize or lessen the damages to wildlife and fisheries resources.

Usually these changes are directed at the elimination of actual destruction to natural areas or to the prevention of habitat loss by modifying construction features. In most projects there are direct wildlife losses due to the destruction of existing habitat through construction measures. In many projects it is possible to offset these damages by providing mitigation features whereby other areas in the project can be enhanced for fish and wildlife purposes.

Indirect loss to fish and wildlife may occur over the entire life of the project, and additional

construction and continued maintenance will compound these losses. In such cases it should be provided that certain lands suitable for wildlife production be purchased in fee title and be kept and maintained for fish and wildlife purposes. Sometimes this is agreed to and is actually made a part of the project. In most cases it is not, however, and no other mitigation or reduction of wildlife loss can be accomplished. This situation occurs all too frequently and, as a result, wildlife habitat is reduced at an alarming rate each year.

When projects are requested by local interests and are approved for study by the appropriate authority, regardless of final outcome, the Louisiana Wild Life and Fisheries Commission makes every effort to participate and cooperate in the planning stages of the project and offer recommendations to minimize or possibly delete fish and game losses. Various approaches such as project re-alignment, spoil placement, water level control and other project modifications can be accomplished to prevent high losses to fish and wildlife resources.

The Commission and other governmental agencies concerned with fish and game conservation are mindful of the need and value of various water control programs in the economic growth and industrial development of our state. However, we are also aware of the history of such development and industrial expansion and recall an overall decline of wildlife populations in areas where these activities took place. Little, if any value was placed on fish and game where industry and other more or less big money interests were concerned. Subsequently, our wildlife suffered losses that can not be replaced and these losses will deprive our citizens from the advantage of enjoying these natural assets. These wildlife losses will also greatly reduce recreational

Land clearing annually destroys thousands of acres important as wildlife producing habitat.



opportunity in many areas of our state. This is not meant to say that some of these projects should not have been built, but rather to indicate or suggest that heavy loss of wildlife habitat could have been avoided if adequate planning and foresight had made fish and wildlife a co-beneficiary instead of ignoring its value entirely. All interests should be given equal consideration in projects funded partially or totally from public revenues.

It is an established fact that most severe damages to fish and wildlife comes as a result of man's attempt to utilize lands previously unsuited for anything but wildlife habitat. In this day and age man's ingenuity and ability have allowed him to reach further into our wilderness areas and transform these remote regions into industrial complexes and other uses not compatible with fish and wildlife interests. Conservationists all over the country are alarmed and greatly disturbed over this trend. If fish and wildlife habitat is continually reduced by our expanding society with no thought of protecting or safeguarding these great resources, it won't be long until the only remaining wild animals or fish life will be in zoos and marinas. Fishing and hunting will only be available to those who can afford to pay the commercial put and take fish or game farm for this privilege.

The development of an interest in and appreciation for fish and wildlife problems associated with all so called "improvement projects" is probably the most important work that can be performed by this section in meeting and discharging its responsibilities as defined under constitutional law. Preservation of fish and wildlife habitat is mandatory since annual and future production of these renewable resources is dependent upon environmental conditions. Approximately one third of Louisiana is considered as wetland, and a high percentage of this is excellent fish and wildlife habitat. The coastal marshes, bottomland areas and extensive lowland swamps are prime examples of regions in our state necessary to the maintenance of high fish and game populations.

The preservation of this natural environment in its present state is the key to all future fish and wildlife production. It is not generally recognized that a single drainage, water control, navigation or flood control project can effect large expanses of land, water bottoms and water areas and that these effects are exhibited by changes in the area's natural ecological character. Plants and animals that live in an area are influenced by the conditions of this environment and any physical change alters the natural chain of events and results in damage to natural productiveness by reducing habitat quality. This condition is rapidly becoming apparent throughout our state. All of our citizens will be losing out by continued

destruction of fish and wildlife habitat. Once a project is built, the damage is obvious. It is then too late to restore or rectify this loss. It is not economically feasible to replace fish and wildlife habitat by project allowed standards after the natural productiveness of the area is destroyed. Thus, prevention of damage and loss to fish and wildlife range and water habitat is the only practical way to safeguard and maintain these valuable natural products.

Whenever a project is formulated and approved for construction it should be an established purpose and responsibility to provide sufficient funds to the appropriate agency for the rehabilitation of suitable land or the acquisition of additional lands equal in size and in value to that of the area damaged or destroyed. This would allow for a continued production of our highly prized renewable fish and game resources.

Over the past two years our efforts have been limited by the lack of qualified personnel. Work loads and responsibilities are increasing steadily and the need for highly trained and competent personnel is growing more acute. In order to better serve the people of Louisiana we need additional funds to expand our present activities and provide more supervision in this important field of fish and wildlife conservation.

By necessity, only the major water control projects were reviewed. This is not intended to mean the many other small projects are not important, because they are, and the accumulative effects of the less spectacular projects are equally as damaging. However, time and lack of personnel would not allow for a close and continued supervision of these numerous projects.

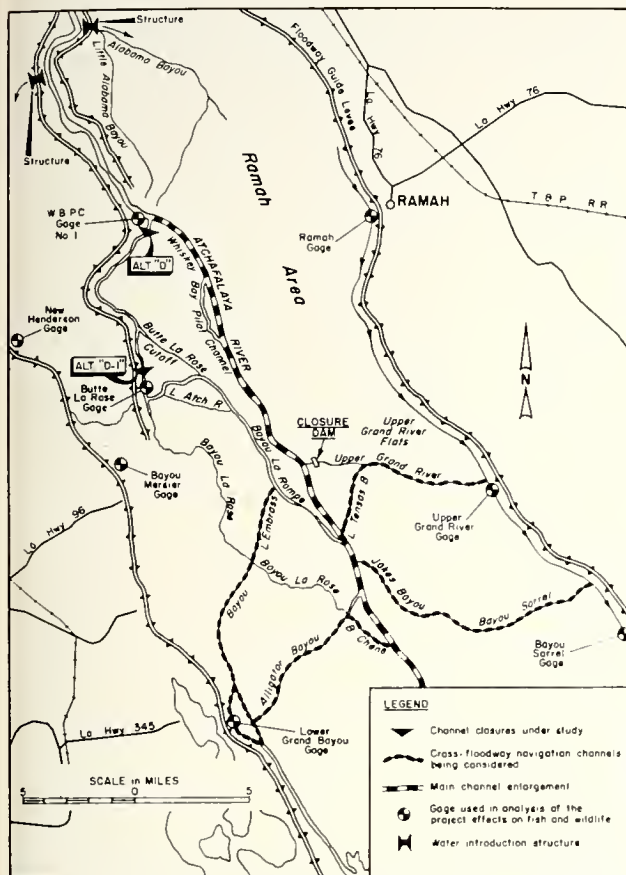
The following paragraphs will briefly summarize the projects studied or continued along with special categories of work performed by the River Basin Section during 1964-65.

Previous biennial reports have described the following projects in detail and the only reason to mention them here is to identify the ones which have not been completed and will require additional coordination from time to time.

- (1) Bayou Lafourche and Lafourche Jump Waterway Project
- (2) Calcasieu River and Pass Project
- (3) Calcasieu River Saltwater Barrier
- (4) Freshwater Bayou Project
- (5) Mississippi River Gulf Outlet Project
- (6) Mississippi River and Tributaries Project
- (7) Red River Below Denson Dam Texas and Louisiana Project
- (8) Numerous Small Watershed Projects

ATCHAFALAYA BASIN FLOOD CONTROL PROJECT

Since the last biennial report was released some important developments in the Atchafalaya



The map above details the present flood control improvements or modifications in the Lower Atchafalaya Basin. These features and their ultimate function have been reviewed by fish and wildlife interests and are the least damaging of all flood control measures previously considered in this project.



Annual water fluctuation within the Atchafalaya Basin is the single most important factor contributing to this region's importance as a valuable sport and commercial fishing area.

Basin Flood Control Project have occurred and the Commission is very hopeful these new considerations will greatly reduce the damage this project will do to fish and wildlife resources.

First of all, the proposed levee extension on the east side of the river from the head of Whiskey Bay Pilot Channel to Little Tensas Bayou has been abandoned. This change was brought about by a concerted effort by the Commission, the Bureau of Sport Fisheries and Wildlife and other groups representing fish and wildlife interests.

The highly controversial uppermost closure of the old channel of the river is being reconsidered as to its final location. As a result of a joint meeting of both the construction agencies and the wildlife interests, an alternate site was suggested for this closure. The alternate site, if found to be satisfactory to all interests, would allow the source of backwater for the Henderson-Opelousas Bay area to remain the same as it is now and the closure would have virtually no effect on the water stages in the west basin area. Backwater flooding would still occur and the duration and frequency of overflow would continue to be controlled by the volume of water passing down the Atchafalaya River System.

Cross basin access and water distribution will be maintained by two distributary channels on either side of the main stem of the Atchafalaya River. This will allow small boat access from the protection levee to the main river. Lateral navigation also will be provided by two additional channels on either side of the main river channel. All four lateral channels will be maintained at project expense.

The Commission also recommended that spoil from continued dredging operations be confined



The Atchafalaya Basin Floodway continues to be one of the major recreation areas in Louisiana as indicated in the above picture which shows one of the numerous access points.

to land areas and not be allowed to enter existing lakes, channels and water bodies important to fishing. Also, it was suggested that dredging in the lower basin be conducted in such a manner that spoil from this work would be placed so it would not form a continuous bank or act as a low lying levee.

Additional features in the form of water introduction facilities are presently being studied and if they are found to be in the best interest of both sport and commercial fisheries resources they will be included in the project as mitigation features.

The increased channel size will tend to reduce overbank flooding by confining moderate flows which occur on an annual basis. This reduction in overflow will be generally detrimental and it is believed that water introduction into both the east and west floodway would help offset this problem.

Because the Atchafalaya Basin Project is so large in scope, it is necessary to approach it on a segment basis. Certain portions of the project will be completed at a time and so on until the total project is finished. This is estimated to take a minimum of ten years. During that time it will be necessary to continue to review this work and coordinate fish and wildlife views and needs with the participating agencies. It will be a long haul before the Atchafalaya Basin will be a completed package, and until such a time the Commission shall continue to represent the fishing and hunting public in this important project.

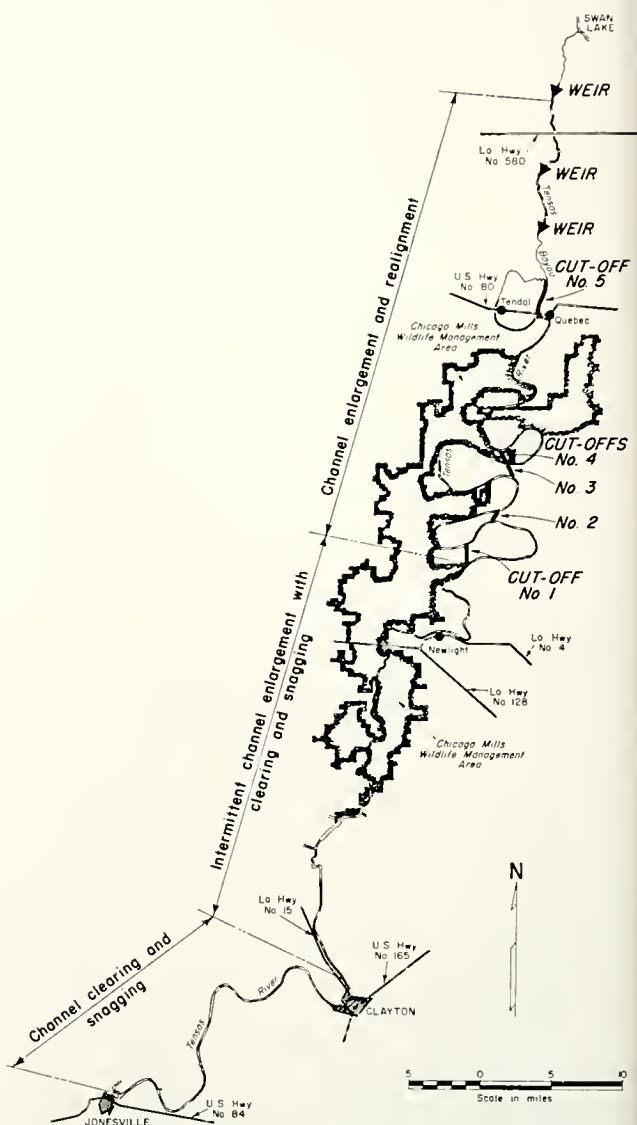
TENSAS RIVER PROJECT

The Tensas River Project had its beginning in August of 1946. The Congress of the United States through legislative action granted authority to the U. S. Army Corps of Engineers to study and develop a plan whereby flood control and drainage problems experienced in the Tensas

River Basin could be reduced or eliminated.

Construction planned in the interest of flood control and drainage included major outlet channels to be funded by the federal government and a system of secondary canals to be developed by local interests. Only those areas effected by headwater and local flooding would be benefited.

Further development consisted of intermittent clearing and snagging of the main channel of the Tensas River between its mouth and the confluence of Bayou Macon, river mile 43. Snagging to a width of 100 feet was carried out between river mile 43 and where Roundaway Bayou runs into the Tensas, near river mile 146. The bottom of the main channel was to be enlarged to a width of 60 feet from river mile 146 to the vicinity of the mouth of Tensas Bayou at river mile 160.



Tensas River Flood Control and Drainage Project.

Over the years this work has been completed in part and now additional drainage and flood control measures have been reviewed by the U. S. Army Corps of Engineers. The current expanded project as presently authorized would call for the clearing and snagging of the Tensas River from its mouth to river mile 61 near the Tensas River Bridge on Louisiana Highway 4. This stretch of channel would have a top bank width of 600 feet.

Additional clearing and snagging along with the channel re-alignment and intermittent channel enlargement would be carried out from approximately the Tensas River Bridge on La. Hwy. 4, river mile 61, to Swan Lake in East Carroll Parish near river mile 170.

In this reach of the project five large bends of the river would be severed and isolated land islands would result. The first cutoff would be at river mile 75 near Big Bayou in Tensas Parish; the second cutoff would begin at river mile 85 near Ridge Lake in Madison Parish; cutoffs three and four would be made by a new channel from river mile 99 to river mile 120 in Madison Parish and cutoff number five would begin at the Tensas Bridge near Quebec, Louisiana and extend to the meeting of Roundaway Bayou and the Tensas River. These cutoffs would straighten the main channel of the Tensas River and allow a faster and more direct discharge of water. The total effect of this project on fish and game resources would result in staggering losses to resident game and fish species of this area.

By definition this is a flood control and drainage project. Emphasis being placed on accelerated drainage as a method to eliminate local headwater flooding. Rapid runoff and accelerated drainage reduces surface water levels and lowers the normal river stages. This is brought about by increased flow velocities which result from a cleared, enlarged and straightened main channel. A good example of this condition is Bayou Lafourche separating Morehouse, Ouachita and Richland Parishes. Large tracts of wetlands adjacent to this stream were drained because of the Lafourche canal project. This was valuable wildlife habitat, now its importance to wildlife, especially waterfowl, is little.

Reduced water levels damage wildlife and fisheries habitat by draining lakes, sloughs and wetland areas necessary for the production of fish and game animals. Vast wetland areas will be removed from overflow waters and this destroys the value of these lands as fish and wildlife habitat.

Basic to forest game is bottomland hardwood forests and within the limits of this project lies one of Louisiana's largest tracts of hardwood timber land. This area belongs to the Chicago Mill Lumber Company and comprises approximately 150,000 acres. Through the courtesy of the

Chicago Mill Company, the Louisiana Wild Life and Fisheries Commission has approximately 115,000 acres of this land under wildlife management. This area is operated as a game management unit and provides hunting and fishing opportunity to thousands and thousands of Louisiana residents.

The continued high abundance of fish and game in this delta country is dependent upon the maintenance of high quality habitat. To maintain quality habitat surface water must be available and in large volumes. Straightening, clearing, snagging and enlarging the Tensas River will dewater large expanses of wetland areas and have damaging effects on fish and wildlife. Hardwood timber will be adversely effected by increasing drainage brought about by this project. The lumber industry is of major economic importance to this area and Louisiana as well. Serious economic losses would result from the drainage of large tracts of hardwood forests.

As segments of this project are authorized, funded and completed, further losses will occur. Greatest loss to fisheries resources will result from the alternation of the natural stream, drainage of lakes and sloughs and clearing and snagging of the main channel. Wildlife will be seriously effected by widespread clearing of the land following drainage and protection from overflow. Many more acres of wildlife habitat will be lost because of land use conversion. This type of game habitat is irreplaceable and cannot be duplicated. Now is the time to call a halt to the outright destruction of our native game species by federally planned and funded projects that do not provide for the conservation and preservation of our wildlife resources.

The Louisiana Wild Life and Fisheries Commission is of the opinion that no further work of this nature be undertaken in the Tensas River at the expense of fish and wildlife. Certain resident problems can be handled as they arise and with cooperation of all interests a more desirable approach to solving our problems can be gained. It should be the responsibility of all interests effected to see that a more comprehensive review of the water problems of this nature is undertaken and these same interests should insist on equal consideration for all elements involved.

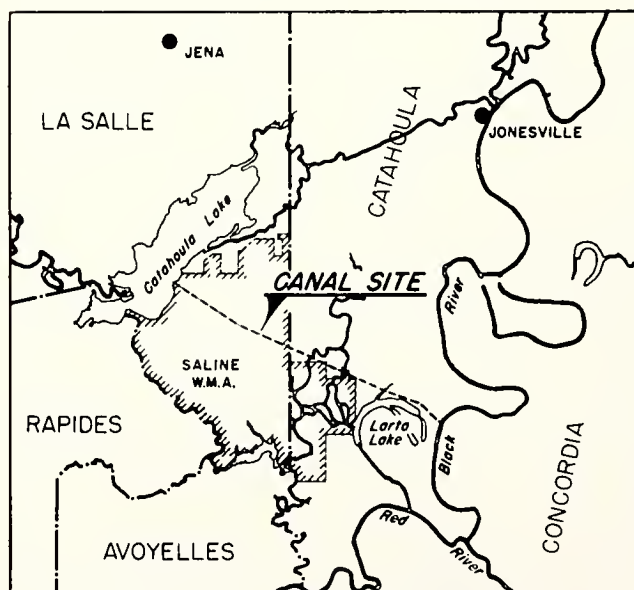
This was the situation prior to the current year when the Commission, local residents and local governing bodies rose up in arms concerning this project and its potential damaging effect on fish and wildlife resources in this area. As a result of this joint effort, the Tensas River Drainage Project has been deferred indefinitely and the valuable fish and game resources of this important river basin have been safeguarded for continued use and enjoyment by the residents of this area.

OUACHITA-BLACK RIVER NAVIGATION PROJECT

This project has caused much controversy for many years because of the damaging effects certain segments would have on Catahoula Lake. The various details and background concerning this navigation project have been presented in preceding biennial reports and will not be repeated here.

Now a plan has finally been worked out whereby the natural characteristics of Catahoula Lake can be preserved while allowing the construction of this project to continue. This plan calls for a diversion channel from Catahoula Lake into the Black River below the much discussed Jonesville Lock and Dam. This channel will be dug and operated at project expense and will pass to the north of the Larto Lake area. The scheduled improvements will provide for regulating stages in the lake and permit its continued use as a fish and wildlife area. The qualities of this natural overflow lake as a waterfowl wintering area will not be harmed and the work and expense in getting this project modification will be more than justified.

With continued cooperation and coordination of all agencies and interests involved in this project, all values, including fish and wildlife, can be maintained. Detailed planning and operation of the water control facilities for Catahoula Lake will continue all through the construction and operation of this project.



The Catahoula Lake Diversion Channel shown above is a project feature aimed at preventing losses of fish and wildlife habitat as a result of the Ouachita-Black River Navigation Project. This diversion Channel will maintain natural conditions associated with Catahoula Lake, thereby preserving this area's value as a fish and wildlife producing area.

The Commission considers this diversion channel and water control facilities a monumental accomplishment and feels that fish and wildlife interests have been well served in the long struggle to safeguard Catahoula Lake and all of its natural values.

OTHER CATEGORIES OF WORK

Several public hearings were attended and statements formalizing the Commission's position in these projects were presented. These hearings were held by the U. S. Army Corps of Engineers to better determine the needs and requirements of all interested agencies, groups or individuals. Some of these related to projects such as the Barataria Bay Waterway, Tchefuncte-Bogue Falaya Rivers, Tangipahoa River, Eastern Rapides and South Central Avoyelles Parishes, Parish Line Canal, Teche-Vermilion and Mergementau Basins and the Red River Basin Comprehensive Project. These projects are either flood control or navigation and the survey work is currently underway.

Special meetings concerning small watershed projects being planned and constructed under public law 566 were also attended. Also, individual P. L. 566 projects were reviewed, studied and recommendations pertaining to fish and wildlife interest were provided to the planning agency. The most important projects reviewed were: Bayou Boeuf Watershed Project, Rapides Parish; Cameron Parish Watershed Project; Lower Tensas Parish Watershed Project; Seventh Ward Canal Project, Vermilion Parish; Lower Tulon Watershed, Bienville and Red River Parishes; and Lower Bayou Teche Watershed, Iberia, Lafayette and Vermilion Parishes. Fish and wildlife habitat preservation in all watershed projects is needed and with continued cooperation with the planning agency, it is hoped that all damages can be held to a minimum.

When looking at existing conditions and selecting a course of action to resolve problems that threaten fish and wildlife, economic factors more or less dictate the manner in which this can be accomplished. Our efforts are restricted to the preservation and management of existing habitat. This is the only intelligent way to meet and dispatch our responsibilities.

We are constantly faced with bigger and bigger public works budgets. These funds are distributed to various agencies working all over Louisiana. In order to meet this added work load, we need more trained personnel to effect adequate coverage and review of all projects that will exert influence on our fish and wildlife resources. It is of paramount importance to maintain close surveillance on all water control projects and submit qualified evaluations and recommendations for the protection and enhancement of our fish and game populations.

MAJOR WATER CONTROL PROJECTS IN LOUISIANA THAT HAVE EFFECTED AND ARE EFFECTING FISH AND WILDLIFE RESOURCES

Name of Project	Type	Status	Description	Effect	
				Direct	Indirect
Barataria Bay Waterway	Navigation	Complete	A 125 feet wide by 12 feet deep channel from the Gulf Intracoastal Waterway to Barataria Pass.	Losses to oyster resources by dredging across existing leases.	Current alteration and wide spread silting over adjacent oyster beds.
Petit Anse, Tigre and Carlin Bayous	Navigation	Complete	A channel 80 feet wide by 9 feet deep in each Bayou to Vermilion Bay.	Actual construction operation initially increased turbidity and destroyed the natural regimen of these bayous.	Increased salt water intrusion and changed the ecological characteristics of the marshes adjacent to the project.
Boeuf and Tensas River and Bayou Macon Channel Improvement	Flood Control	Active	Arkansas and Louisiana 480 miles of channels clearing, snagging, realignment and enlargement.	Accelerated runoff, drained swampland and bottomland hardwood areas and actual construction destroyed existing fisheries habitat.	Reduce water levels and effectively de-water previously wetland areas—land use changes and increased land clearing followed.
Atchafalaya River	Navigation & Flood Control	Active	Entire Atchafalaya Flood Control complex from Old River to Atchafalaya Bay and especially the main stem of the river.	Overflow has been drastically reduced or effectively eliminated. This has harmed fish and wildlife resources. Spoil from continued dredging has filled fishing lakes and bays.	Channel closures altered water exchange patterns and decreased fish and wildlife production. Frequency of over-flow reduced by cross-channel closures, backwater effect reduced in some areas of the basin.
Calcasieu River and Pass	Navigation	Active	A channel 400 feet wide by 40 feet deep from the Gulf of Mexico to the port of Lake Charles.	Increased saltwater intrusion over a wide area. Damages to fisheries habitat due to dredging and other construction operations.	Ecological changes in the surrounding marshes. Reduction in quality of habitat for waterfowl, furbearers and other wildlife species.
Mississippi River Gulf Outlet	Navigation	Active	A channel 500 feet wide by 36 feet deep from the Gulf of Mexico to New Orleans.	Actual construction destroyed vast expanses of marshland that were valuable wildlife areas. Provided saltwater intrusion all the way to New Orleans and Lake Pontchartrain. Oyster beds were destroyed by dredging.	Ecological conditions were adversely effected on a vast area of marshland adjacent to the new channel. Water patterns were altered and silt or dredged material covered and destroyed other important and valuable oyster areas.
Freshwater Bayou	Navigation	Active	A channel 125 feet wide by 12 feet deep between the Gulf Intracoastal Waterway and the Gulf of Mexico.	Destruction of valuable waterfowl and furbearer habitat by channel construction.	Potential saltwater intrusion. Dewatering effect on adjacent marshlands.
Amite River and Tributaries	Flood Control	Active	Enlargement of Amite River by channel clearing, snagging and enlargement.	Destruction of existing fisheries habitat and natural stream regimen.	Lowering of water stages and altered the natural ecological character of this stream. Changed the natural productivity of this stream.
Mermentau River	Navigation	Active	A channel 100 feet wide by 9 feet deep from Grand Lake to the Gulf and from Grand Lake to Bayous de Canes and Nezplique and Plaquemine Brule.	Saltwater intrusion below catfish lock.	Altered marsh ecology and reduction in habitat quality.
Ouachita-Black River	Navigation	Active	A channel 9 feet deep from the mouth of the Red River to Camden, Arkansas.	Flooding of wildlife habitat. Mitigation features will safeguard Catahoula Lake as a backwater overflow area.	Improved sport and commercial fishing will be destroyed. Hardwood timber by inundation of bottomland areas.
Tchefuncte-Bogue Falaya River	Flood Control	Under Survey	Clearing and snagging in upper reaches above La. Hwy. 21.	Destruction of fisheries habitat by removing trees and logs.	Rapid and violent stage changes will reduce fisheries resources.
Tangipahoa River	Flood Control	Under Survey	Clearing and snagging and realignment from the mouth to above Hwy. 21 Bridge.	Destruction of fisheries habitat by removing trees and logs.	Rapid and violent stage changes will reduce fisheries resources.
Tickfaw River	Flood Control	Active	Clearing and snagging of 16 miles above the mouth.	Destroy fisheries habitat and increased turbidity.	More rapid stage fluctuations. Reduced fish production.
Plaquemine Lock	Water Diversion	Under Survey	Improve Plaquemine Lock for water diversion from Mississippi River.	Eliminate stagnation and improve surface water conditions.	Improve fish and wildlife habitat with improved water quality.

Engineering and Construction Section

WILLIAM E. ACKLEN
Engineer

The Engineering and Construction Section of the Fish and Game Division has the responsibilities of maintaining and keeping in a good state of repair, all building and other properties of the Fish and Game Division.

Examples of work are buildings like the work shop and storage building located on Commission owned property at the District One headquarters at Minden. The building is a wood frame structure with asbestos shingles on the outside and an asphalt shingle roof. It was designed, the plans drawn and the specifications written by personnel of the Engineering and Drafting section.

The construction was awarded to a private contracting firm but was built under the supervision and inspection of the Engineering personnel.

The Carpenter Crew constructed a new materials and lumber storage building at the District Seven Headquarters. This building was constructed with a reinforced concrete floor with wood framing and galvanized iron roof and sides. It also has lumber racks for various types and dimensions of lumber.

They also constructed a building for the Education and Publicity section which has about 700 square feet of floor area. This building is used for the purpose of preserving, mounting, and storing various specimens of wildlife, which are used in their displays and lectures. It is built on a reinforced concrete slab and covered with vinyl asbestos floor tile. It is of wood frame cover on the sides and roof with galvanized sheet iron and is sealed on the inside with plywood and painted. The building is insulated in the walls and attic, and is air-conditioned. It has shelves and cabinet storage area and is equipped with sink and water and working table for mounting of animals.

Another example of the work being done by the Carpenter Crew is the addition of 1200 square feet of floor area added to the District Three office building in Alexandria. This work consisted of adding four new offices approximately 10' x 12' each and a conference room about 15' x 30' in size. This addition is on concrete foundation with concrete block chain wall and piers with pressure treated substructure. The building is built with a wood frame structure with asbestos shingles on the side and asphalt shingles on the roof, all backed with a water proof felt over a solid sheeted wood wall. The in-



Combination workshop and storage building at District I Headquarters in Minden. This building was designed and plans drawn by personnel of the Engineering Section.

terior of the building is finished in 1/2 inch sheet rock which is taped, floated, sanded and finished with a wainscoat panel from the floor up about three feet on the walls. The ceilings are covered in acoustical ceiling tile. The walls are insulated with fiber glass insulation batting and the attic is insulated with blown fiberglass.

The old part of the building was altered by moving and rearranging some partition walls and the entire building was redecorated. The room air-conditioners were removed and a central heating and air-conditioning system was installed.

They also constructed a storage building 24 x 100 feet in size in which various types of equipment and materials will be stored. This building has a concrete floor with wood frame structure covered with twin rib aluminum roofing and siding. It has several partition walls to form separate rooms, some equipped with double drive-in doors. Electrical lights are installed throughout all the building with convenient outlets for power tools and other electrical equipment.

The Construction and Maintenance Crew also constructed two additional bedrooms on the Red Dirt Game Management Area Residence. They also made other changes in the old part of the house, then remodeled it throughout, which consisted of new floors, new paneling and acoustical ceiling in all rooms. The kitchen was remodeled, including new cabinets and paneling. While working at the Headquarters area, they also remodeled the Guest House, which consisted of moving some partition walls and enclosing a porch into the bedroom and then building a new front porch with a concrete floor and screen side walls. There were new storage closets built for storing linens, blankets, towels, etc. The building was repainted throughout the inside.

The Carpenter Crew made some alterations in the office building located in Ferriday and Monroe. The office in Ferriday had some new

storage closets built and some offices rearranged to make the operation of the office more efficient for the increasing number of personnel working from that office. The painters also repainted all of the inside of the building. The office at Monroe also had some repairs made.

There were some buildings heavily damaged by the Hurricane Betsy at the District Seven Headquarters in Baton Rouge. Some buildings had to have an entire new roof and others had major repairs to them. One had to be demolished and rebuilt entirely. The Carpenter section also constructed several small portable buildings, which are built on runners so they can be moved easily. Some are used for permit stations on the Game Management Areas and others for storing outboard motors, chemicals, pumps and other equipment used by the Hyacinth Control Section. They also constructed compartment truck bodies for hauling deer for restocking.

The Fish and Game Division has two three-quarter cubic yard draglines, one mounted on a spud barge and assigned to the marsh areas of the state for building earthen dams, water control structures and various other reclamation work in the marshes. The other one is assigned to the uplands of the state which is used for building roads, fills, cuts, bridges, etc. on game management areas and digging canals and building impoundments.

The Engineering section made a survey on several hundred acres of land located in Claiborne Parish for the purpose of building a green tree reservoir. This survey consisted of running several miles of level lines, which included profile lines for levees and contour lines to determine what depths water could be impounded for waterfowl development. The Engineering section also supervised the construction of various dams and other water control structures for various impoundments.



Two coyotes trapped by C. L. Foster near Martha-ville in Natchitoches Parish.

Predator Control Section

The Predator Control Section is composed of eight trappers and one supervisor, plus one full time trapper employed by the Police Jury of Caddo Parish.

In the past we have listed wolves among predators taken, which are in reality coyotes. The following is a list of animals taken:

November 16, 1963-December 31, 1964

Skunks	163
Coyotes	204
Housecats	46
Foxes	463
Bobcats	29
Misc.	273*

*Includes 84 feral dogs, also 28 bears which the Supervisor of this section helped trap in Minnesota and transport to Louisiana.

January 1, 1965-November 30, 1965

Skunks	428
Coyotes	212
Housecats	67
Foxes	532
Bobcats	171
Misc.	711*

*Includes 145 Feral dogs and 6 beavers.

Coyotes continue to be the animal that causes the most complaints from various sources, especially from large land owners with cattle operations, or users of geese in their cotton fields. With the exception of our work on the wild turkey ranges and the exotic bird release areas, most of the benefits of our work is for agriculture, rabies control programs for the State Health Department, and research work on parasites, disease and food habits of coyotes, foxes and bobcats conducted by Louisiana State University. Also we remove beavers when it is determined that they are causing damage to timber.

Following is the record of rabies occurrence in Louisiana in 1964 and 1965, which includes parishes where rabies occurred and species involved. 1964—Bossier—3 foxes; Caldwell—1 fox; Claiborne—2 foxes, 1 dog; DeSoto—1 dog; Jackson—2 foxes; Jefferson—1 cat; LaSalle—1 fox, 1 dog; Lincoln—3 foxes, 3 dogs, 1 cow; Morehouse—1 dog; Ouachita—4 foxes, 3 dogs; Orleans—2 dogs; Sabine—2 foxes; Union—17 foxes; Washintgon—1 bat; Webster—29 foxes, 2 dogs. TOTAL 73.

1965***—Bienville—8 foxes, 2 dogs; Bossier—6 foxes, 4 dogs, 2 bats, 1 skunk, 1 coyote; Caddo—1 bat; Claiborne—11 foxes, 1 dog; East Carroll—1 dog; Jackson—10 foxes; Natchitoches—1 cow;

***Through November 30.

Orleans—1 bat; Ouachita—2 dogs, 1 bat; Red River—1 fox, 3 dogs; Union—9 foxes, 4 dogs; Webster—10 foxes, 2 dogs; Winn—1 fox, 2 dogs. TOTAL 87.

Most of the rabies is occurring in the Northern part of the State, West of the Ouachita river. Rabies seems to spread from the wild species to the domesticated, principally from foxes.

This section also works on Game Management Projects, Managed deer hunts, etc.

Aquatic Vegetation Control Section

FRED L. MYERS
Coordinator

DONALD V. LEE
Field Supervisor

VIRGIL T. LAPHAM
Research Biologist

The borders of the State of Louisiana enclose an area containing many natural lakes, streams, and bayous of great beauty. These waters are capable of furnishing almost unlimited amounts of some of the finest sport fishing in the world. Not only are these waters of interest to the fisherman, but our mild climate permits almost year-round enjoyment of boating, water skiing, swimming, and other forms of water sports. The ever increasing interest in these forms of recreation has created a demand for more and more readily accessible areas where these sports could be enjoyed. This demand has prompted the construction of many artificial impoundments to argument the existing natural areas. The value of land adjacent to these areas has soared as this property has been purchased for permanent campsites and even homes. When these values are added to the sums spent for boats, fishing tackle, water sports equipment, outboard motors, and other supplies, it amounts to millions of dollars. It has also been found that the average fisherman spends almost five dollars per man per fishing trip for food, drinks, bait, boat rental, and other supplies. It is readily obvious that the water areas of Louisiana are a highly valuable natural resource and greatly contribute to the state's economy.

It is unfortunate that the multi-million dollar per year value of these areas can be destroyed within a period of less than five years by the unchecked proliferation of aquatic weeds. The prevention of this catastrophe is the responsibility of the Aquatic Vegetation Control Section.

The control and removal of weeds from the vast water areas of the State is not an easy task, nor a cheap one, yet few tax supported programs

have ever given such large returns for each dollar expended. The administration of this program has ever sought more effective, economical, and easier methods to accomplish its mission, and through the years has been highly successful.

The Aquatic Vegetation Control Program, as it exists today, evolved as an extension of the old Water Hyacinth Control Program. Since 1959 this program has been a combined effort of the State of Louisiana and the U.S. Corps of Engineers. Of the state administered portion of the program, Louisiana furnishes 30 percent and the Corps of Engineers 70 percent of the funds involved. The state's work has been, for the most part, in the lakes and streams of the upper portion of the state, while the corps work has been largely limited to the navigable waterways in the southern part of the state. The state has now cleaned most of the hyacinths and many of the other emergent weeds from the many streams and lakes in the northern part of the state to the point where only an occasional "maintenance" spraying is necessary to retain control. Constant vigilance throughout the years is necessary if we are to maintain this degree of suppression. The seed of the water hyacinth is impervious to all of the herbicides now in use. These seeds have been found to remain viable for many years and germinate when temperature, exposure to air, and moisture conditions are favorable. Each of these plants are then capable of producing over 65,000 "daughter" plants vegetatively, plus depositing hundreds of new seed produced in the blossoms on each of the flowering stalks. Even though total eradication appears to be impossible, the benefits of the program are almost incalculable. The father of our control program, the late Dr. George Nelson Gowenlock, back in 1946, estimated the annual losses from water hyacinths at very conservative seven million dollars per year. The value of our waters to the economy of the state has increased a hundredfold since those early days, but when compared to even his obsolete estimate, the cost of the program which has averaged to less than \$300,000, per year, would amount to only 1/25th of the total estimated yearly losses. Sound, business-like management, plus a vigorous research program has been necessary to obtain these results.

The expenditure of appropriated funds has been supervised by the Coordinator, Fred L. Myers. Records of all expenditures are maintained so that at any time these unique records reveal instantly any discrepancy in the performance of any crew or individual in the program. This system of cost accounting has played no small part in the efficient and economic operation of the section.

The physical performance of the field spray crews is closely supervised by the Field Supervisor, Donald V. Lee. His duties involve supervising the care and maintenance of all boats,

motors, and other equipment to ensure they are in satisfactory operating condition, making work assignments for the crews, checking performance of the assigned tasks, and checking sources of re-infestation to enable planning of additional activities.

Spray crews are dispersed over the state so that the greatest degree of control can be achieved with the least amount of travel.

At the present time, we are operating with twenty-nine spray crews located at the following places:

Lake Wallace, Caddo Parish	1 crew
Lake Bistineau, Webster Parish	2 crews
Saline Lake, Winn Parish	3 crews
Spring Bayou, Avoyelles Parish	5 crews
Crowley, Vermilion Parish	1 crew
Martin Lake, Lafayette Parish	1 crew
Henderson, St. Martin Parish	3 crews
Pierre Part, Assumption Parish	1 crew
Bayou Pigeon, Iberville Parish	1 crew
Rosedale, Iberville Parish	4 crews
Newellton, Tensas Parish	1 crew
Bear Island, Livingston Parish	2 crews
Madisonville, St. Tammany Parish	1 crew
Slidell, St. Tammany Parish	1 crew
Miller's Lake, Evangeline Parish	1 crew
Monroe, Ouachita Parish	1 crew

In addition to spray crew personnel, two mechanics are also retained to repair and maintain outboard motors, spray equipment, and boats used by the section.

Each crew is equipped with a light-weight pumping unit consisting of a rotary hydro-tractor pump and a 2½ h.p. air-cooled gasoline engine mounted on a wood frame. This unit produces a nozzle pressure not exceeding 60 p.s.i., and does not cause fogging of the spray mixture. There is sufficient pressure to throw a stream a distance of forty feet, with the outer ten-feet fanning out for excellent coverage. The spray solution is mixed in a fifty-five gallon drum carried in the boat, which is an aluminum "V" bottom propelled by a 6 H.P. motor. A crew can treat five to eight acres in a normal work day. A heavier type of spray unit has been fabricated which pulls water from the stream, mixes it with 2-4, D and sprays it simultaneously. Being somewhat heavier, a larger aluminum boat is required to transport this unit. This unit has been found to be of great value by eliminating the need for a mixing compartment, and it will throw the stream much farther. A crew using this unit can treat up to twenty acres in a normal work day.

It is abundantly clear that if we in Louisiana are to continue to capitalize on this very real financial asset and permit its continued use by the sportsmen of our state and attract the tourist, a very real effort must be made toward finding effective methods to control these water loving plants which are usurping and pervading the

waters of the State. The research program is presently conducted by Mr. Virgil T. Lapham.

To accomplish this task in the most effective and economical manner, it is imperative that a sound research program be maintained and encouraged. Louisiana is unique in that this has been standard operating procedure ever since, and even before, the inception of the program, and the benefits accruing from this practice have amply demonstrated its worth. Dr. Gowenloch's pioneer work with the then new Phenoxy-hormone-type herbicides enabled the discontinuance of the inefficient and tremendously costly hand and mechanical removal programs. This research promoted the development of the present formulations of 2-4-D which have permitted us to economically remove the vast mats of water hyacinths which has ruined almost every body of water in Louisiana. In addition, contrary to experience in the other areas, having no research program, our operations have not been found harmful to the fish, wildlife, livestock, adjacent plants, crops, or people. In fact, our hyacinth removal program has been carried on for a period of over fifteen years without a single valid damage claim being paid, or even filed. Few, if any, other states or agencies have such an outstanding record, or obtained comparable results at anywhere near our annual expenditure.

The removal of the hyacinths, although imperative, has not been accomplished without complications. As a general rule, in our area, still water means clear water. Prior to their removal, the hyacinth mats shaded out the underwater plants and held their growth in check. The removal of these blankets has permitted sunlight to penetrate the water and proliferation of underwater plants is becoming an ever increasing problem. Alligatorweed, released by the removal of the hyacinths, is now also spreading.

The control of this submersed vegetation presents a new set of problems. These plants grow almost wholly under the surface of the water and are not generally affected by regularly used 2,4-D or spraying techniques. The most effective control is obtained only by treating the entire volume of water in which the plants are growing. For this reason, it is mandatory that any material used for such a treatment be harmless to fish, wildlife, livestock, adjacent plants, or humans, yet be effective against a large number of species of aquatic plants. Very few herbicides can meet these requirements. Cost is also of major importance as the amount of chemical required to treat the entire water column is far in excess of the amount required to treat by standard sprays the vegetation growing only on the surface.

Mechanical removal has proven too costly and biological control agents such as fish, the manatee, or hippopotamus, are either ineffective, or

so far been found unable to withstand our winters. Stress has therefore been placed on finding effective chemical controls.

The various chemical companies are aware of our problem and are developing new products to meet our needs. Two of these new developments were discussed in the 10th Biennial Report. Evaluation and testing of these materials has been continued during the interim period and the early indications of their effectiveness has been found valid. The present price structure precludes the initiation of a tax-supported control program using either of these materials on a state-wide basis within the limits of our presently available funds. However, it is felt that these materials are well within the means of private individuals, or local civic and sportsmen groups using their own funds, to alleviate weed problems in their local areas. The people of Delhi have proven the practicability of such a plan. They wished to renovate Judd Lake, a natural lake which had been ruined by aquatic weeds but which once furnished excellent fishing. They raised their own money and purchased their own chemical, asking only advice and technical assistance. In this instance, thirty gallons of endothol-silvex was sufficient to eradicate almost all of the plants in the entire lake. Fishing is now again excellent.

Endothol-silvex is highly effective against a wide range of nuisance plants, yet is found to have a very low toxicity to fish, wildlife, livestock, adjacent vegetation, and man. Effectiveness is apparently not reduced by the presence of silt or organic matter in water. No need for elaborate equipment is involved. The total required amount of chemical is poured into the water at one spot at a point as far from the outlet of the area as possible. The herbicide diffuses through the water without agitation and kills as it goes. It has been found that the addition of one pint of X-77 surfactant to each gallon of this herbicide will still further improve its effectiveness. One gallon of endothol-silvex is ordinarily sufficient to kill most of the nuisance plants in one acre-foot of water. Treatment, at present retail prices, would thus cost about ten to twelve dollars per acre foot. Treatment, in farm ponds, has remained effective for a period of two to three years.

Diquat has been found to be highly effective in control of duckweed, waterlettuce, algae, and many submersed aquatic plants. A granular formulation of this material is now being developed which will greatly simplify control of duckweed and waterlettuce. Present cost would run approximately twenty-five dollars per acre.

Alligatorweed has consistently resisted control measures attempted by both state and federal agencies. Several materials have been found to be effective, but excessive costs prohibited general acceptance. Results of repeated testing indicate that an economical treatment has now been devel-

oped by our research. The commercially available mixture of picloram and 2,4-D has been combined with a small amount of DMSO and X-77 surfactant. When this combination has been mixed with water and sprayed in our standard manner, all of the aerial growth and most of the existing mat of alligatorweed has been destroyed. The cost per acre is now computed at about \$15.00 per surface acre, per treatment. One to two treatments is usually sufficient to obtain effective control. Several safety factors are now being evaluated and if this treatment is accepted, it will be a major factor in solving one of our major weed control problems.

Algae, commonly called pond scum, appears to be an increasing problem. A number of new materials have been tested, and found to give satisfactory results. Recent research, using a dispersant with the commercial algacides have given still better control. A number of dispersants are now on hand and will be tested and evaluate during the coming year. It is hoped that we will be able to reduce the amount of algacide needed, both to lessen the cost of treatment, and to lower the hazard of a fish-kill. Most algacides are highly toxic to fish and must be used with great care.

Research must be continued to discover new and better materials and techniques. In working with living things, solution of one problem commonly only leads to the finding of still another. One never has all the answers, but we now are in a position where we have some solution to most of our aquatic weed control problems. We may not be able to use these materials in a state wide program, but we are in a position now where we can advise interested persons or agencies on what to use and how to use it safely. Future research, now in the planning stage, may disclose even more effective, safer methods and materials.

Drafting Section

EDDIE L. BENNETT
Draftsman

The Fish and Game Division Drafting Office is comprised of one full time employee and a part-time student aid who works approximately twenty hours each week. This office is responsible for much of the general map work that is required by the Department as well as the Fish and Game Division. Plans for construction of buildings by the Fish and Game Division are produced in detail. Various types of graphs, maps, sketches, contract drawings, tables and forms are prepared from time to time for reports, papers, publications and magazines.

During this biennium plans were prepared for a pavilion-type building to be erected on Waddil

Tract in East Baton Rouge Parish, for District V Headquarters Building in DeRidder, and a pilot floor plan for District VII Headquarters Building in Baton Rouge.

The wildlife management area maps of Saline, Fort Polk, Catahoula, West Bay, East Carroll and Russell Sage were revised and brought up to date with respect to roads, pipe lines, boundary changes, road names, construction changes and area hunting restrictions. Some other maps were redrawn completely. These included areas that were expanded or changed to such a degree that revision of the original map was impractical. In the instance of new areas recently acquired or reclassified the initial map was prepared. Included in this group are: Soda Lake, Concordia, Georgia-Pacific, Alexander and Caney Wildlife Management Areas. These maps are compiled by using information from the latest available topographic quadrangle maps along with personal knowledge from observation by field personnel, aerial photographs, records and other reliable sources. These maps are then printed, used in various management practices related to each area and made available to hunters using the area during managed hunts.

The annual deer season map, turkey and bear season map and wildlife management area location maps were produced for publication in the *Louisiana Conservationist* and in brochure form each year with the outline of hunting seasons and hunting and fishing laws.

Various other projects were completed during the last two years. Among this group are the following: design of the shoulder patch for the new uniforms; tables of organization in the department and divisions to be used in the training program; thesis title sheets for papers compiled by students as a cooperative effort between this department and the state university; illustrated cover for Division Personnel Directory; lettering of names on certificates for those completing the training program; fabricating a hall directory and identifying door marking in Old Peabody Hall; illustration of a fish tag design; illustration of turkey feather and foot age and sex characteristics; release and range maps for introduction of exotic game bird species; a base map series to expedite map work; maps, graphs and questionnaire forms for use by the Statistical Section; plans for signs to be erected on or near public boat launching ramps and parking areas constructed by this department; posters for visual aid to be used in legislative hearing on hunting seasons; and plans for entrance sign for Saline Wildlife Management Area.

Other maps and graphs were prepared for use in the *Louisiana Conservationist* from time to time and for publications in the form of reports and/or technical papers.

Education

SAM C. MURRAY
Supervisor

Education! This seems to be the magic word of all Louisianians today. More and more of our people are beginning to realize that if this great state is to continue to move forward, a better understanding of our problems is essential. Our fish and game resources present many problems and if this very important phase of our economy both from a recreational and a monetary standpoint, is to be maintained it is necessary that citizens in all walks of life know what is meant by "fish and game management"—they should know why our biologists are constantly working on new ways and methods that will tend to keep our fish and wildlife populations in "balance"—they should know why—with the terrific increase in the numbers of people each year that proper game management and the practices advocated by our professional game biologists is a "must". They should be told why we have game laws and regulations and the Enforcement Agents are only trying to protect our game in order that everyone will get a fair chance to enjoy the wonderful sport of fishing and hunting. They should realize that in order for the Commission to function properly we must have the cooperation, help and understanding of the public. The Education Section is charged with this responsibility, and thanks to other divisions within the Commission for their splendid help, our Wildlife Instructors are well informed in the many facets concerning the activities and objectives of the Commission.

This section was set up to enlighten as many people as possible of the work being done by the Commission to improve and perpetuate our wildlife for future generations. Much time is spent working with students and teachers in our schools. An average of 250 wildlife programs are presented to some 8,000 students each month during the school year. We believe that if our young people are told of the need for sound game



Dr. Lyle St. Amant, Chief of Oysters, Seafood and Waterbottoms, lecturing at one of teachers workshops coordinated by Education Section.

management they will better understand the problems when they become the leaders of our state in the future.

Programs are presented to many other groups such as civic and service clubs, sportsmen leagues, church groups, garden clubs, teacher workshops and similar organizations. Wildlife Instructors spend many weeks each summer in youth camps all over the state giving lectures and programs on wildlife. Each instructor has all of the necessary equipment to present an interesting and informative program to a group of businessmen at a luncheon or to a group of kids on a picnic. Louisiana's wildlife story has been told to thousands via radio and television. To bring this story right to the public, displays of wildlife scenes and of those depicting the vast economic value of our fish and wildlife resources are erected and manned by our personnel at some 25 fairs and festivals each year. These are viewed by tens of thousands of people from Shreveport to Franklinton and from Bastrop to Cameron.

The Education Section makes available to teachers, schools and libraries a number of pam-

phlets which deal with fish and wildlife and their management. These booklets are also supplied to students in limited numbers upon request. Literature may be obtained free from any of the District offices. These are located in Minden, Monroe, Ferriday, Alexandria, DeRidder, Opelousas, Baton Rouge and New Orleans. In addition, the Commission operates a film library located in Old Peabody Hall, Capitol Station, Baton Rouge, Louisiana. Color and sound movies about fish and wildlife are loaned to interested groups without charge. The only cost to the borrower being the return postage which he must pay.

Realizing that far too many hunting accidents occur each year, the Education Section has been very active in it's participation in Gun Safety Clinics held throughout the State. In these endeavors we have received splendid cooperation from the Fish and Game and Enforcement Divisions.

There remains much to be done but we do feel that inroads have been made in getting our story over and we intend to step the tempo up whenever and wherever possible.



Wildlife Instructor J. P. Culpepper presenting a program on gun safety at a summer camp.

Game Section

CHARLES R. SHAW

Supervisor, Game Section and Pittman-Robertson Coordinator

The responsibilities of the Game Section include research, development and management activities concerning all resident and migratory species of game. In addition, there is an active program on such exotic game species as the Black Francolin and the Red Junglefowl, and others which show potentialities for our state are being investigated.

The Game Section includes all of the "Pittman-Robertson Section", (Federal Aid in Wildlife Restoration) as well as some personnel who are involved only in activities financed wholly by state funds. All work together in the implementation of the Louisiana Wild Life and Fisheries Commission's statewide program of game management.

One of the primary duties of the Game Section of the Fish and Game Division is the acquisition and operation of game management and/or public shooting areas to increase and retain the recreational opportunity for the present and future sportsmen of Louisiana. A list of these areas is included and the specific information on the various areas listed in the table is included in the reports by the eight District Supervisors. The men holding these positions are all technically qualified wildlife biologists. Due to the accelerated posting of private lands and the clearing of many bottomland areas for agricultural purposes the acquisition and retention of areas for public use assumes greater importance each year.

Game research activities are carried out primarily under P-R Project 29-R with Robert E. Murry serving as Project Leader and the specific studies on the various species being reported on by the study leader, (wildlife biologist) to whom the particular research work is assigned. A special statistical project under Herbert Stern, Jr., also assists with various studies on game and fish. This project will be reported on separately.

The eight districts into which the state is divided for administrative purposes by the Fish and Game Division serve as natural subdivisions for the development work supervised by John L. Haygood, Development Leader, who heads up P-R Project 30-D. His responsibilities include not only the development work included under the Pittman-Robertson program but also the extensive activities financed wholly by state funds. The District Supervisors (wildlife biologists) will report on the management and developmental activities within their respective districts. This will



CHARLES R. SHAW
Supervisor

include the game management and/or public shooting areas, managed hunts, etc.

A table or listing of all game management areas showing acreage, location and a map showing the location of each is included.



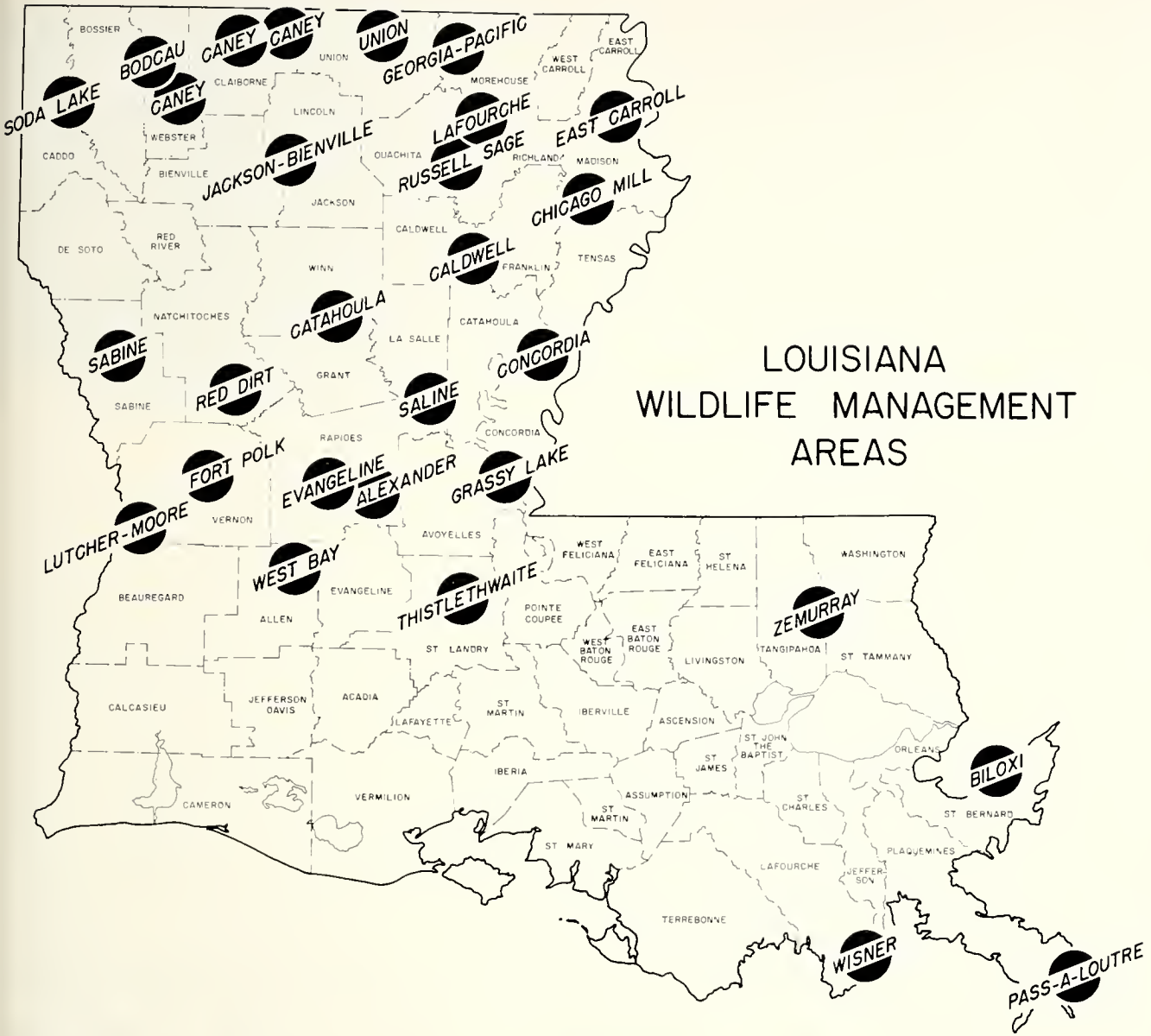
The cream of the crop. Little Rusty Cook of Bastrop, Louisiana, with a gobbler he helped bag during the two half day season held in 1965 on the Georgia Pacific Wildlife Management Area.

**LOCATION AND SIZE OF AREAS OPERATED BY THE FISH & GAME DIVISION
FOR THE BENEFIT OF THE SPORTSMEN OF LOUISIANA**

<i>Name of Area</i>	<i>Acreage</i>	<i>Parish(es)</i>	<i>Name of Area</i>	<i>Acreage</i>	<i>Parish(es)</i>
Alexandria Wildlife Management Area	7,875	Rapides	Grassy Lake Game Management Area	25,000	Avoyelles
Bayou Bodcau Game Management Area	32,471	Bossier & Webster	Jackson-Bienville Game Management Area	22,000	Jackson & Bienville
Biloxi Marshlands Water- fowl Development Area ...	39,728	St. Bernard	LaFourche Public Shooting Area	1,875	Richland
Bonnet Carre Game Management Area	3,324	St. Charles	Idlewild Plantation Game Research Refuge	1,731	E. Feliciana
Caldwell Game Management Area	12,123	Caldwell	Lutcher-Moore Game Management Area	55,000	Vernon
Caney Game Management Area	31,000	Webster & Claiborne	Red Dirt Game Management Area	38,000	Natchitoches
Catahoula Game Management Area Approx.	40,000	Winn & Grant	Russell-Sage Game Management Area	15,640	Ouachita, Richland and Morehouse
Catahoula Lake Waterfowl Refuge	1,000	Catahoula	Sabine Game Management Area	12,000	Sabine
Chicago Mill Game Management Area	105,000	Madison, Franklin and Tensas	Saline Game Management Area	60,275	LaSalle & Catahoula
DeRidder Airport Public Hunting Area	800	Beauregard	Shiloh Creek Public Shooting Area	1,200	Morehouse
East Carroll Game Management Area	9,640	East Carroll	Soda Lake Wildlife Management Area	1,200	Caddo
Evangeline Game Management Area	15,000	Rapides	Thistlethwaite Game Management Area	11,100	St. Landry
Finch Bayou Public Hunting and Fishing Area	600	Union	Union Game Management Area	10,000	Union
Fisher Creek Public Hunting and Fishing Area	500	East Carroll	Waddill Wildlife Refuge	224	E. Baton Rouge
Fort Polk Game Management Area	52,000	Vernon	West Bay Game Management Area	58,000	Allen
Georgia Pacific Game Management Area	41,980	Morehouse	Wisner Public Shooting Grounds	30,000	Lafourche
			Zemurray Game Management Area	5,294	Tangipahoa



Camping during deer hunts is becoming more popular on many game management areas.



Waterfowl impoundment. Levee work was completed on this 260 acre waterfowl rest area on the Russell Sage Wildlife Management Area east of Monroe, Louisiana. Development projects of this nature should increase waterfowl populations in the Monroe area.

DISTRICT I

ROBERT B. KIMBLE

Supervisor

JAMES H. TAYLOR

Biologist

The Louisiana Wild Life & Fisheries Commission's District One is comprised of seven parishes located in the northwest portion of the state: Caddo, Bossier, Webster, Claiborne, Bienville, Red River and DeSoto. The District One is headquartered in Webster Parish at 806 Talton Street, Minden. Four game management areas totaling some 85,000+ acres are located in District One. These areas are Jackson-Bienville 21,000 acres; Bodcau 32,471 acres; Caney W.M.A. 31,000 acres and Soda Lake 1,200 acres.

Most of the work in District I is done on the game management areas; however, various jobs within the district pertaining to deer range surveys, re-stocking of game in some areas, game research, technical guidance on private and government owned lands and many other related game problems that arise are handled by district personnel.

During this biennial the District I Supervisor (John L. Haygood) was promoted to 30-D Project Leader with the Commission and this position was filled by Robert B. Kimble, Biologist from District IV.

Soda Lake Waterfowl Management Area

KINSEY MARTIN

Acting Area Supervisor

Soda Lake is an old lake bed comprising some 1,200 acres located approximately 15 miles north of Shreveport just east of Highway 1. Two earthen terraces 5 feet and 3 feet in height, 600 and 1,400 feet in length respectively were constructed for purposes of holding water for ducks. Two concrete water control structures were built for purposes of de-watering the area during the spring and summer months. Each year several acres of this reservoir is disced and planted to good duck foods and is flooded in the fall by pumping water from adjacent Twelve-Mile Bayou by use of a Caddo Parish police jury owned pump.

The area was opened for duck hunting during the 1963-64 and 1965-66 seasons by season permit. Hunting is permitted on Mondays, Wednesdays and Saturdays, mornings only, to prevent excessive hunting pressure on ducks. Spot checks during the duck seasons reveal that the area is heavily used and the duck kill is comparable with other good duck hunting lakes in this section of the state.



ROBERT B. KIMBLE

Supervisor

Bodcau Game Management Area

KINSEY MARTIN

Area Supervisor

The Bodcau Game Management Area is located on the U. S. Corps of Engineer's Bodcau Flood Control Project. Through cooperative agreement the Corps of Engineers granted the Louisiana Wild Life and Fisheries Commission a license to develop and manage the wildlife on this area. A new lease agreement was signed in October of 1964 valid for twenty (20) years or until October of 1984. The boundaries include all government owned lands lying along Bayou Bodcau from the Arkansas State line to Bellevue in Bossier and Webster Parishes, an area occupying approximately 32,000 acres.

This area is designed to furnish as much outdoor recreation for the public as possible while restrictions are kept to a minimum. All persons hunting the area are required to have a season permit. Our records indicate that through this means and the variety of hunting offered the Bodcau Game Management Area is one of the most heavily utilized game management areas in the state.



New creosote bridge completed on public access road on Bodcau G.M.A.



A five acre game watering pond recently built on Bodcau G.M.A.

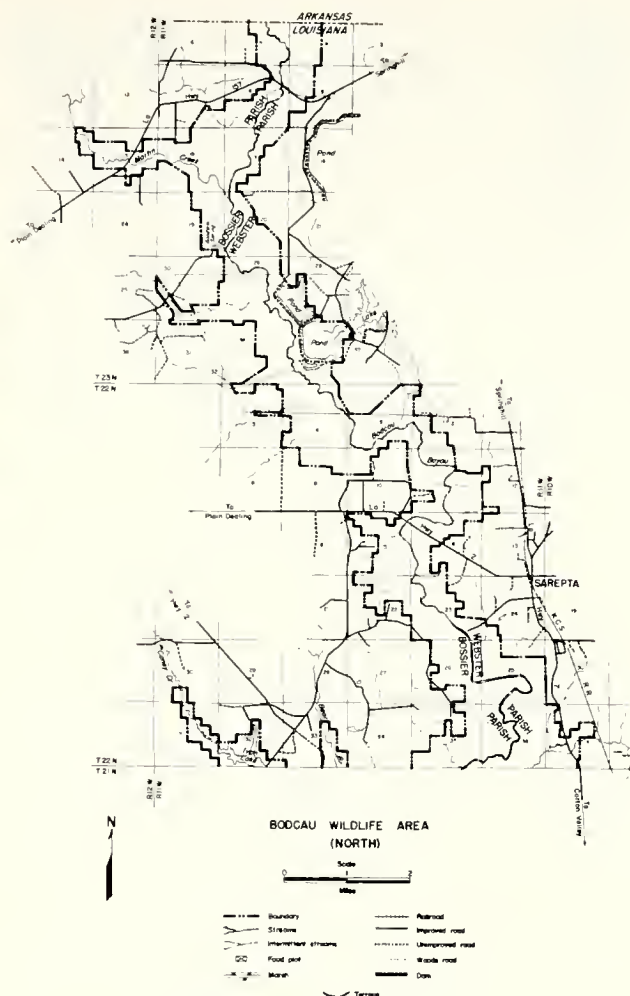
Approximately 1,500 acres of prime pin-oak flats are flooded each fall for duck hunting. In 1962 approximately 1,000 acres of upland old fields and woods were fenced against free ranging cattle and hogs. This area has since proven its worth by improving food conditions for several game species thus furnishing more and better hunter opportunity. Several acres of old fields in this fenced area are disced and planted each year to increase food for turkey, quail, dove, deer and other species. This area furnished excellent dove hunting during the fall of 1965.

A release of 75 Black Francolins was made during October of 1965 and an additional 120 birds will be released in the spring of 1966 within the 1,000 acre fenced area. This fenced area furnishes very good habitat for this exotic bird and it is hoped that this experimental release will be successful.

During January of 1965 nine (9) wild turkeys (7 hens and 2 gobblers) were released on the area. These birds came from the state of Florida. This number was released in addition to the twelve (12) birds previously trapped elsewhere in Louisiana and released on the area in 1963. Dis-



Public access road under construction on east side of Bodcau G.M.A.



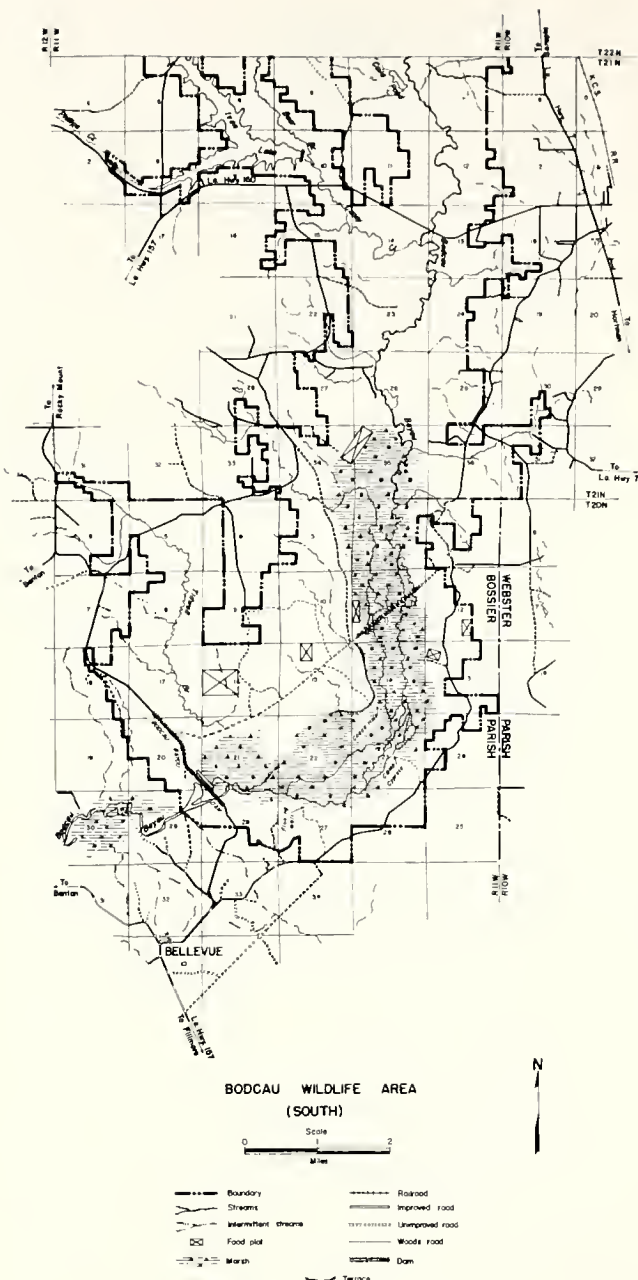
Bodcau Wildlife Area (N)

trict personnel and hunters have seen young and old turkeys on the area on several occasions since the release date. Future development work will be directed toward betterment of turkey habitat.

Two wildlife openings of 3 acres each were developed on the area. These areas were cleared of standing trees and brush, some honeysuckle planted, and fenced with barbed wire. Several more such areas are planned. These areas are designed to increase the food supply for deer.

In accordance with the habitat improvement plan controlled burning of the forest and fields is being carried out to improve wildlife habitat. Several hundred acres of uplands are control burned each winter. Commission personnel with assistance and cooperation of Corps of Engineer's personnel are continuing the wildlife habitat improvement program of thinning dense stands of pine timber. During the past two years two thinning sales were made and this money was spent back on the area for wildlife development work.

Public access roads are continually being improved. During the past year a new access road



Bodcau Wildlife Area (S)

was opened, which borders the east and south side of the area. The road has been pushed out, several culverts installed, and two small creosote bridges constructed. Much more work needs to be done to maintain this road in good order.

Over the past two years several miles of boundary lines were brushed out, repainted and boundary signs put up. Boundary lines play an important role in the function of a game management area. They help prevent illegal hunting and contain the hunter on the area during differential seasons between the game management area and the surrounding area.

Hunter bag checks made by District One personnel on the area indicate that hunters experi-



Black Francolin holding and conditioning pen on the Bodcau G.M.A.

enced successful hunts in pursuit of the variety of game offered on the Bodcau Game Management Area. This is further proven by the large number of season permits requested by local hunters to hunt the area.

The Bodcau Game Management Area was open for trapping during the regular statewide trapping season in 1964 and 1965. The District One office issued three (3) trapping permits in 1964. A total of 26 raccoons, 11 mink, and 3 opossum were trapped during 1964. Only one (1) trapping permit was issued for the 1965 trapping season and the results are not yet available.

Jackson-Bienville Game Management Area

LEVI McCULLIN
Area Supervisor

The Jackson-Bienville Game Management Area is located in the eastern part of Bienville Parish and the northwestern part of Jackson Parish, about 12 miles south of Ruston and 12 miles north of Jonesboro. This area is leased free of charge from several landowners by the Louisiana Wild Life and Fisheries Commission for a period of 10 years. By far the largest landowner is Davis Brothers' Lumber Company. Other landowners are Continental Can Company, Strugis-Nix Lumber Company, Sizemore Est., Barnard et. als., Louis E. Smith, E. B. McConathy and A. R. Garrett. There are some 22,000 acres of land in this game management area. Timber type is composed mostly of rolling hills of short-leaf loblolly pine with three major creek bottoms composed of hardwoods, such as oaks, hickory, beech, etc.

The vacancy caused by the sudden death of the area supervisor (Mr. Floyd Sizemore) in October 1964, was filled by Mr. Levi McCullin.

In past years transient hunters have been unable to find suitable places to camp overnight; therefore the Louisiana Wild Life and Fisheries Commission has recently leased a two (2) acre tract of land near the game management area to furnish a camping area for hunters. This area

when completed will have a water well and two outdoor toilets.

In January of 1964 district personnel released 18 wild trapped turkeys on the area. Of this total six (6) were gobblers and twelve (12) were hens obtained from the state of Florida. District One personnel kept close surveillance on this release. Reproduction has occurred and the area now has a good population of turkeys. Some of these birds will be trapped, banded and released to study movement population density, longevity and gather other research data.

During the past year several acres of pipelines and wildlife openings have been disced and planted to good grain producing plants to benefit the turkey population. These areas have received considerable use by both turkeys and deer.

There are some 15 miles of roads to maintain on the area. These roads are kept in good order so as to provide easy access by hunters. Several miles of mowed and disced trails are maintained for further hunter use.

Hunting on the area is by permit. Squirrel and quail hunting is by season permit while deer hunting is by daily permit. Squirrel hunting in the 1964 season was very good while the season of 1965 was considerably poorer due to poor acorn crop in the fall of 1964.

The 1964 deer season was for five (5) days any deer or until 400 deer were harvested whichever came first. There were two five (5) day seasons for deer on the area in 1965. The first was for 350 any deer (except spotted fawn), with the second five days being for bucks only. This second five day season was by season permit, the first year this type of deer hunt has been held on the area. Success of this hunt will be reported in a later biennial. The following table illustrates hunter participation each year and deer harvested since the Jackson-Bienville Game Management Area has been opened for public hunting.



Overnight campers on the camping area for hunters on Jackson-Bienville G.M.A.



Deer killed on opening day on Jackson-Bienville G.M.A. by Don Parkan, Rt. 4, Ruston.

JACKSON-BIENVILLE HUNTER PARTICIPATION AND DEER KILL

Year	No. Hunters	Deer Kill		
		Males	Females	Total
1958 (Bucks only)	4,938	97	0	97
1959**	4,257	147	178	325
1960*	2,616	44	32	76
1961*	2,350	76	46	122
1962*	2,142	59	92	152
1963***	3,883	139	186	325
1964***	2,847	66	73	149
1965***	3,132	83	91	174

*One day either sex.
 **Two days either sex.
 ***Five days either sex.

Due to the buildup in raccoon populations on most of the game management areas it was decided that these areas should be made available for public trapping. The Jackson-Bienville G. M. A. was open to trapping by season permit (no gun allowed) for the 1964 and 1965 regular statewide trapping season. The District One office issued four (4) trapping permits for 1964. There were 69 raccoon, 3 mink, 1 opossum, 2 fox and 2 bobcats trapped from the area during this period. There were no requests for trapping on the area during 1965.

Caney Wildlife Management Area MARION E. AUSTIN Area Supervisor

During this biennial in October of 1964 the Louisiana Wild Life and Fisheries Commission and the U. S. Forest Service signed a cooperative agreement on managing all of the Kisatchie National Forest lands in the Caney District for betterment of wildlife. In October of 1965 an additional 3,000 acres joining the northwest end of the Corney tract was leased from private owners. This entire 34,000 acre wildlife management area is located in parts of Claiborne and Webster Parishes. The purpose of this wildlife management area is to furnish as much outdoor



Newly installed boundary entrance signs on the Caney W.M.A.

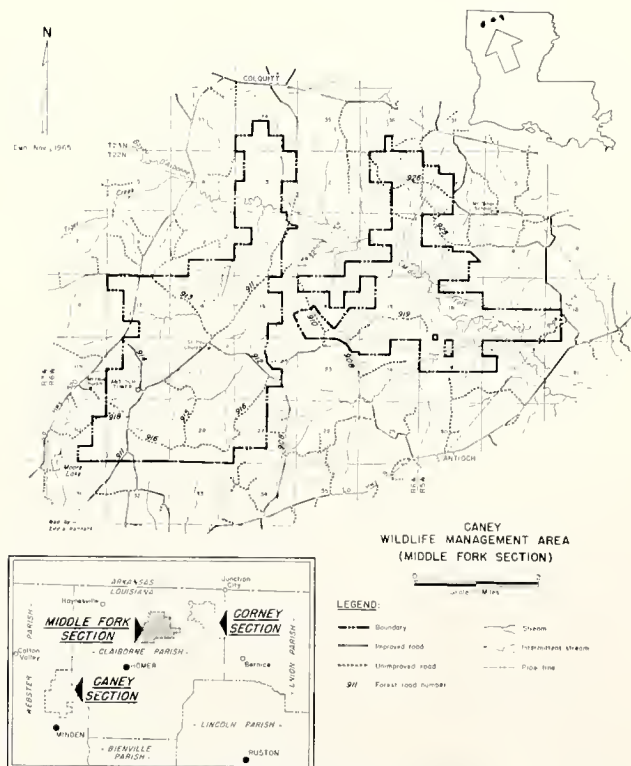
recreation as possible while restrictions are kept to a minimum. All hunting seasons and bag limits will run concurrent with the seasons in Webster and Claiborne Parishes.

The Caney Wildlife Management Area is divided into three separate tracts of land. The Caney Creek tract (12,000 acres) is located five (5) miles north of Minden in Webster Parish. The Middle Fork tract (10,000 acres) is located approximately 10 miles northeast of Homer in Claiborne Parish while the Corney tract (12,000 acres) lies some 20 miles northeast of Homer. The terrain of the entire area is composed primarily of rolling hills drained by intermittent

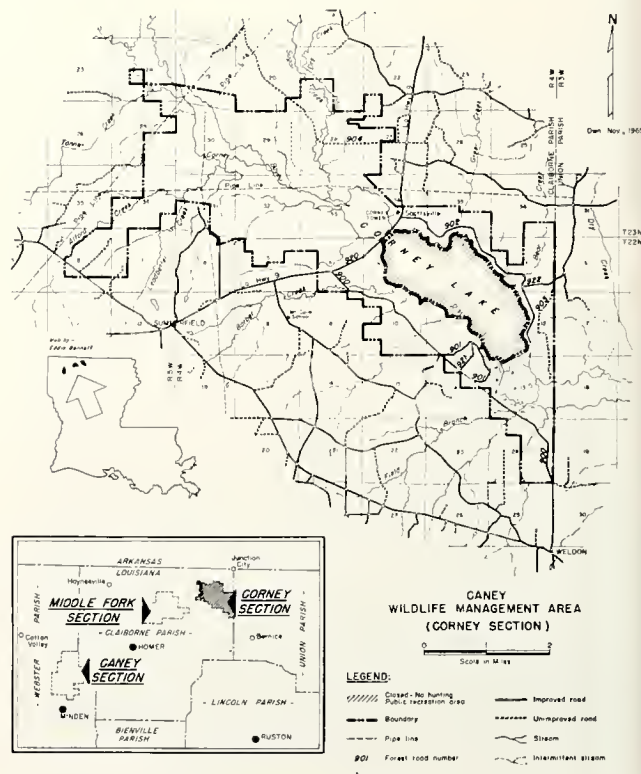
streams. The soils vary from red clay to sandy with white to yellow clay loam in the creek bottoms. The hills are covered with pure loblolly—short-leaf pine stands while the branches and creek bottoms are composed of a mixture of pine-hardwoods. The two large creek bottoms, Middle Fork and Corney are composed of a mature stand of predominately water and willow oaks. Honey-suckle patches of from 1-5 acres in size are dispersed over the entire area, these are ideal food for deer.

Our long range wildlife management plans call for creating wildlife openings dispersed over the entire area covering some five (5) per cent of the lands composing the management area ranging in size from 1-5 acres each. These openings will be carefully selected and will be maintained to produce many varieties of foods for the different game species. A controlled burning program is to be initiated whereby several hundred acres are burned each year to increase the game carrying capacity of the land. Formation of a green tree reservoir for upper Corney Lake is proposed in the wildlife area management plans. Such reservoirs furnish excellent waterfowl habitat in this part of the state. Our plans also will call for restocking the area with wild trapped turkey as soon as these birds become available.

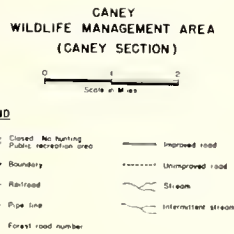
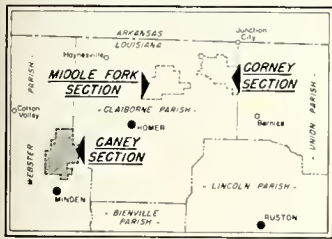
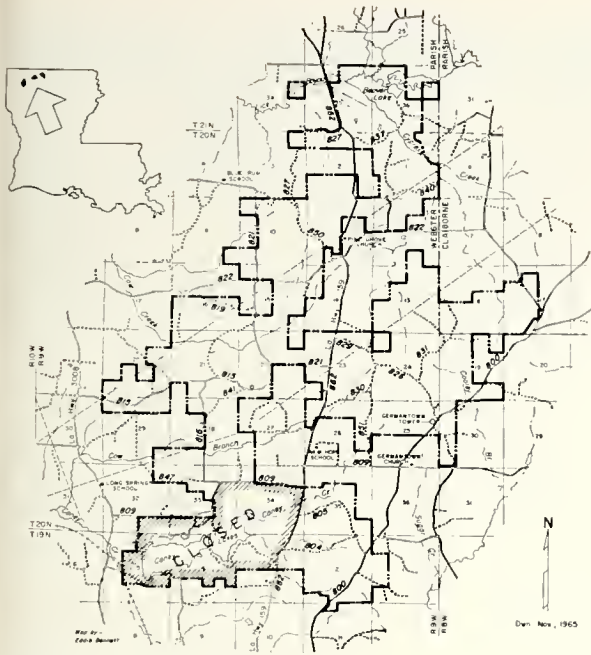
The entire Caney Wildlife Management Area is easily accessible by automobile, since the U. S. Forest Service plans, builds and maintains a network of all-weather roads. This network of roads



Middle Fork Section



Corney Section



Caney Section



CLIFFORD T. WILLIAMS
District Supervisor

Union, Ouachita, Richland, Morehouse, West Carroll and East Carroll.

Efforts by the Fish and Game Division during the past biennium have been directed toward more public recreational usage of our wildlife management and public hunting areas plus the initiation of a wild turkey trapping program for restocking suitable but uninhabited wild turkey ranges throughout the state. To date the program has been successful.

A brief report of activities on the different wildlife management areas in District II during the 1964-65 biennium is as follows. This brief report deals mainly with the four game management areas, four public hunting areas and the wild turkey trapping program. It may be noted that trapping of fur-bearers has been permitted on the game management areas for the first time this biennium, that the last upland game refuge was converted to a game management area and a much increased wild turkey trapping operation was initiated.

East Carroll Game Management Area

RUSSELL CAMPBELL
Area Supervisor

LONNIE WALTERS
Utility Laborer

The East Carroll Game Management Area, leased from the Chicago Mill and Lumber Company, comprises 9640 acres of bottomland hardwoods in the southern part of East Carroll Parish.

It supports a high deer population and squirrel hunting has been good. Hunting pressure during the last two years has been light. Development projects on the area have dealt mainly with improving hunter access through wood trails and roads.

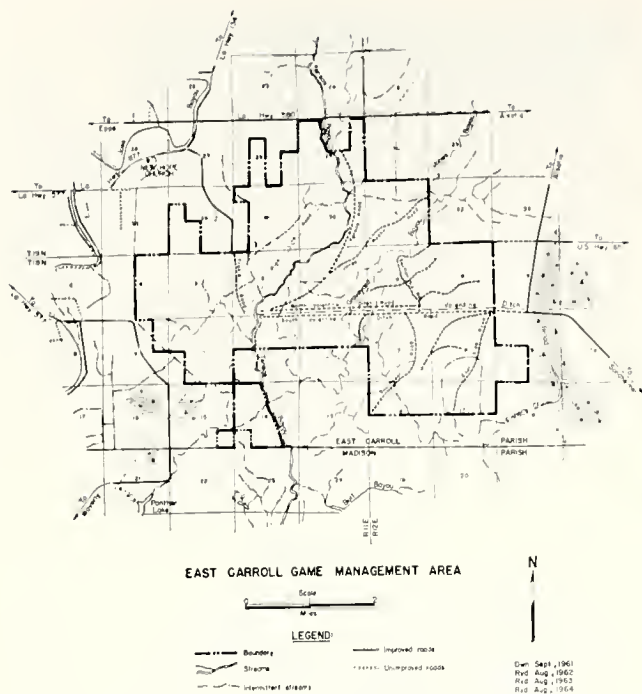
DISTRICT II
CLIFFORD T. WILLIAMS
District Supervisor

JERRY W. FARRAR
District Biologist

CHARLES R. BAUR
Biological Aide

GUY CAMPBELL
Biological Aide

Located in the north and northeast part of the state, District II is headquartered at Monroe and consists of eight parishes: Jackson, Lincoln,



E. Carroll GMA

MANAGED HUNTS

Controlled hunts have been continued each year for squirrel and deer on a still hunt basis. Hunting pressure has been low but some good kills have occurred.

Squirrel. Hunting has been permitted each year on a season length permit basis. Squirrel harvest has been low and hunting pressure has been light during 1964-65. Improved access roads should increase the squirrel harvest in the future.

Deer. The East Carroll Area was open to archery and gun hunters the past two years. The number of bow hunters has been estimated at approximately 12-15 per year. Only one deer was killed by arrow and that occurred in 1965.

During 1964 and 1965 a total of 30 buck deer were killed and 1118 hunters utilized the area. In 1964 only 5 deer were killed and in 1965 the kill reached 25 legal bucks. Hunting pressure increased from 375 in 1964 to 743 for 1965 for each five day period.

Georgia Pacific Wildlife Mangement Area

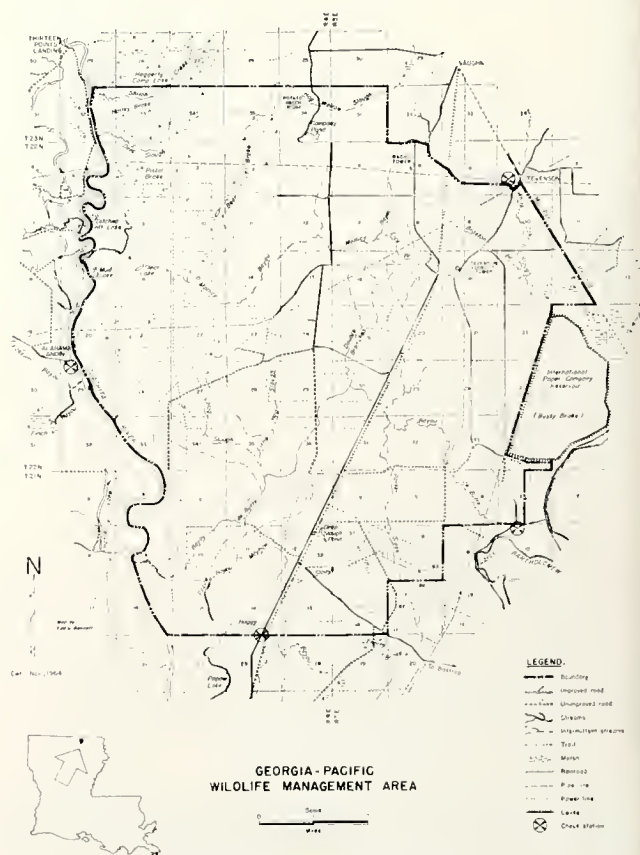
P. D. "Pat" JONES
Refuge Warden

During the past biennium, the old Terzia Refuge located in Morehouse Parish about 5 miles northwest of Bastrop, Louisiana, was converted to a wildlife management area through a new lease agreement between the Louisiana Wild Life and Fisheries Commission, the Georgia Pacific Paper Corporation, Crossett, Arkansas, and Mr. John W. Barton, Baton Rouge, Louisiana.



Jerry Farrar, Fish and Game Division District biologist, replaces an entrance marker on the newly acquired Wildlife Management Area which is leased and managed by the Louisiana Wild Life and Fisheries Commission. Entrances such as this will serve as access points for Louisiana sportsmen during the controlled Game Management Area hunts.

The Georgia Pacific Area is comprised of approximately 42,000 acres of mixed bottomland hardwoods, pine, and mixed pine hardwoods. The terrain varies from flat areas near the Ouachita



Georgia-Pacific GMA



Project Leader John L. Haygood and District Supervisor Clifford T. Williams weighing and aging deer at check station on the Georgia-Pacific Game Management Area.

River to gently rolling to flat terrain in its eastern section.

This area has supplied 85 wild turkeys for restocking other game management areas within the state during the last 3 years. With a humble beginning, the turkey trapping operation had reached a full scale project during the last segment to this biennium. With good success another



He's a she! The first bearded wild turkey hen encountered during turkey trapping operations. Beards are not uncommon according to reports from other states; but, so far, 7¼ inches seems to be a Louisiana record.



Jack Rushing, one of many District II personnel involved in the turkey trapping project, loads one of the three net cannons during trapping operations on the Georgia Pacific Wildlife Management Area.

75-100 birds can be removed for transplanting throughout Louisiana in 1965-66.

During 1964 Georgia Pacific was opened to the public for 5 days of controlled hunting for bucks only: a total of 6490 hunters killed 317 legal bucks; in 1965 hunting efforts decreased to 5838 with a kill of 165 legal bucks. In addition to this hunter kill in 1965, three deer were known to be killed during the archery deer season. In April 1965, two half-day turkey hunts were permitted and 26 gobblers were killed.

The conversion of Georgia Pacific to a Wildlife management area will not be a detriment to existing wildlife but will be an asset to the northeastern part of Louisiana. Managed hunts will furnish additional hunting opportunities for Louisiana sportsmen as well as being of economic importance to Morehouse and adjoining parishes.

Russell Sage Wildlife Management Area

E. S. "Jack" RUSHING
Area Supervisor

NED WHATLEY
Utility Laborer

The Russell Sage Wildlife Management Area, purchased in 1960 by the Louisiana Wild Life and Fisheries Commission, comprises approximately 15,000 acres of bottomland hardwoods in Lafourche Swamp east of Monroe, Louisiana. It was purchased with funds from the Russell Sage Foundation and is managed solely for wildlife and public recreation purposes.

During the past biennium much has been accomplished on this area. Borrow pit areas north of Highway 80 were developed and maintained to increase public usage for fishing.

The headquarters building was maintained in



Russell-Sage Game Management Area Supervisor E. S. "Jack" Rushing weighing a nice buck while Charles R. Shaw, Supervisor of the Game Section records data.

good condition and overnight usage by Commission personnel increased.

The exterior boundary lines and woods roads were maintained as well as food plantings for turkey and deer. Levee work was completed on a 2,000 acre green tree impoundment in the lower



Jewell Sawyer, Commission employee from Monroe, Louisiana, is releasing one of the adult gobblers trapped on Georgia Pacific Wildlife Management Area. The release was made on the Russell Sage Wildlife Management Area which comprises parts of Ouachita, Morehouse and Richland Parishes.

portion of the area, levees were constructed around 260 acres near Highway 80 for a waterfowl rest area—this is complete except for a water supply, and right-of-way clearing was performed for waterfowl impoundments north of Highway 80.

Plans are being formalized for area timber stand improvement, additional all weather access roads and deer food plant introductions. The wild turkey release has been completed.

The area has been open to the general public for all types of hunting except for wild turkey on a still hunt basis. Season permits are required except for the either sex deer hunts.

During the past biennium squirrel hunting has been fair to good, waterfowl shooting fair and deer hunting very good. Only one trapper has applied for a permit to trap this game management area during the past two years.

In 1964 the area was opened for its first any deer hunt. Thirty-four deer were killed on opening day: 18 does and 16 bucks. Hunting pressure totaled 682 hunter efforts this one day. The estimated deer kill for 1964 was 100-110 deer.

During 1965 a total of 833 hunters killed 43 deer during the opening day any deer hunt. Of this number 29 were does and 14 were bucks. The estimated deer kill for the 1965 season is in excess of 100 deer. So far, each year 3 or 4 deer have been killed during the archery season on this wildlife area.

Union Parish Game Management Area

CURTIS L. HOLLIS

Area Supervisor

The Union Game Management Area is located approximately 3 miles west of Marion, Louisiana, in the north central part of Union Parish. This tract of land is owned primarily by Olin Mathieson Chemical Corporation and is leased and managed by the Louisiana Wild Life and Fisheries Commission on a 10 year basis. The addition of approximately 2,000 acres to the area during the past biennium, brings a total of 11,510 acres of this mixed pine-hardwood type habitat under management for the sportsmen. Timber and game management practices have worked well together on this area as evidenced by improved deer browse conditions. The major portion of project work during the past 2 years has been toward maintenance and management. This included work on boundary lines, access roads, food plots for turkey habitat improvement, and controlled hunts for the general public. Intensive work was initiated toward location and management of existing wild turkey flocks in order to boost the presently sparse population.

MANAGED HUNTS

Controlled hunts continued each year for squir-

rel and deer on a still hunt basis. Separate archery and gun hunting seasons were held for deer hunters.

Squirrels. Hunting has been permitted each year on a season length permit basis. Hunting pressure was moderate and squirrel harvest was good during 1964-1965. Spot checks of 135 hunters in 1964 showed an average of 3.07 squirrels per hunter. The 1965 season was somewhat slower. It is thought that hunting success was poorer early in the season due to unfavorable hunting conditions.

Deer. Archery deer hunters succeeded in harvesting two doe deer during the past biennium, with approximately 150 hunter efforts being made each year. Many hunters obtained shots at deer and recreational value was high.

During 1964 and 1965 a total of 159 deer of either sex was harvested and 1975 hunters utilized the area. In 1964, 856 hunters bagged 48 bucks and 28 does, for a total of 76, showing an improvement over the previous 1963 season in which 511 hunters bagged 49 deer of either sex, as shown in preceding biennial report. In 1965, 1,119 hunters killed 47 bucks and 36 does, for a total of 83, again showing an improvement over the previous season. Each of the successive seasons was open for 5 days to either sex deer hunting.



Shown are Georgia Pacific Game Management Area Supervisor, P. D. "Pat" Jones, and District biologist, Jerry Farrar, with a fawn taken from the area to be sent to Louisiana State University for special deer studies by Louisiana State University cooperative wildlife research unit.

Public Hunting and Fishing Areas

There exists within District II, four public hunting and fishing areas which were leased primarily for public use on an uncontrolled basis. By "uncontrolled basis" we mean without the requirement of a permit or according to statewide hunting and fishing regulations as set forth by the Louisiana Wild Life and Fisheries Commission within its yearly Hunting, Fishing and Trapping Regulations brochure.

These areas are: the Finch Bayou Public Hunting and Fishing Area in Union Parish, the Fisher Creek Public Hunting and Fishing Area in East Carroll Parish, the Lafourche Public Shooting Area in Richland Parish and the Shiloh Creek Public Hunting Area in Morehouse Parish. Their size varies from 600 to 1800 acres each.

Areas of this nature have provided good fishing, fair to good waterfowl shooting and fair squirrel and deer hunting during the past biennium. The areas are more suited to fishing and waterfowl sports. The Lafourche Public Shooting Area was developed mainly as a green-tree waterfowl hunting spot and Finch Bayou primarily for fishing recreation.

DISTRICT III

CLYDE E. HARRISON
District Supervisor

ROWLAND P. VERNON
District Biologist

REGINALD G. WYCOFF
District Biologist

This District is located in central Louisiana and is made up of Rapides, Winn, Grant, Vernon, Natchitoches and Sabine Parishes. The District Headquarters, located in Alexandria, is quite convenient to a number of agencies, both State and Federal, with whom a number of cooperative projects are in progress. Five of the seven Wild-



CLYDE E. HARRISON
District Supervisor

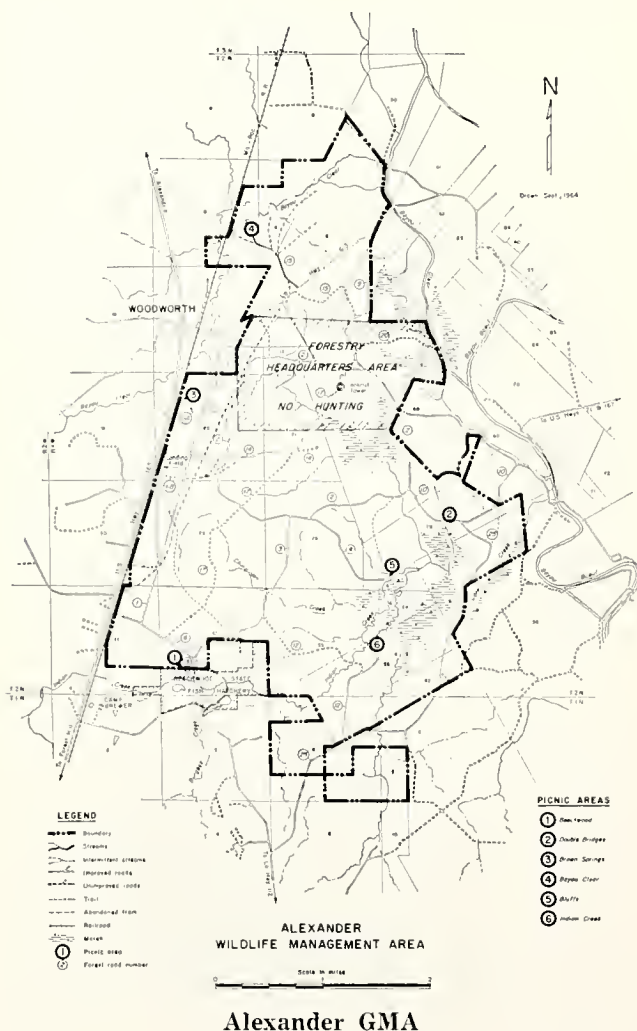
life Management Areas administered by this District are owned by Federal and State agencies. Most of the wildlife work is done on the management areas but a number of other jobs, including deer range surveys, duck and dove trapping and banding, duck and dove hunter bag checks, maintenance of the waterfowl resting area on Catahoula Lake, and other minor jobs are handled each year. The District office serves as an information center for sportsmen, hunters, students, and civic groups for Commission activities.

A brief summary of the activities on the District Three management areas follows:

Alexander Forest Game Management Area

T. EARL DEEN
Area Supervisor

Located in central Rapides Parish, the 8,000 acres of rolling piney hills making up this area are owned by the Louisiana Forestry Commission. Several large creeks and numerous intermittent streams provide good drainage. Timber varies from different aged shortleaf and loblolly pine



plantations to mixtures of natural pine and hardwoods to pure stands of hardwoods along the stream bottoms.

This area formally became a unit of the Commission's system in 1962 and has become available to sportsmen for hunting during this current biennium. It had not been hunted for about forty years. Prior to hunting, in 1962 and 1963, a little time was devoted to deer trapping for transplanting in other parts of the State. The limited trapping activity resulted in a catch of forty-eight deer. In the fall of 1964, the first squirrel hunt was held. Due to the lengthy period this area had been closed to hunting, sportsmen considered it a very attractive area and considerable hunting pressure was exerted. Spot checks of hunters indicated the average kill to be one and one-half squirrels per effort and many hunters learned that a long closed season had little to do with squirrel populations. The hunt in 1965 did not attract as many hunters and the average kill was .89 squirrels per effort.

Following the pattern of deer hunts on the other management area, five day managed deer hunts were held in 1964 and 1965. Each year the hunt began with either sex being legal and in 1964 was to continue in this manner until 125 animals were killed and in 1965 until eighty were taken. The first year, hunters required two days to get the quota in 1965, three days were needed. In 1964, 1,343 hunting efforts were made with harvest of 142 animals; in 1965, 1,663 hunting efforts were made to take eighty-three deer. Archers took two deer both in 1964 and 1965 during the special archery deer season.

Activities other than managed hunts are limited to boundary maintenance, minor road repair, and routine patrolling.

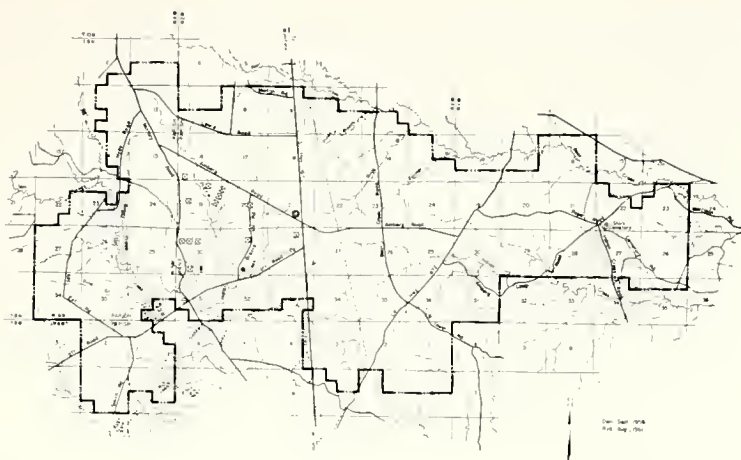
Catahoula Game Management Area

VOLMER BOWEN
Area Supervisor

Owned by the U. S. Forest Service, this area of 40,000 acres is located within the Kisatchie National Forest south of Winnfield. The topography varies from gently rolling hills to poorly drained flats. The higher ground bears a forest cover of longleaf, loblolly, and shortleaf pines both in pure and mixed stands. Hardwoods are found in the lower areas as well as mixed with the pines. Squirrel and deer have been available to hunters for several years during the managed hunts. Hunter participation is normally good and in 1964 the average kill was .96 squirrels per hunter effort. In 1965, a greater squirrel population was present following the excellent mast crop of 1964 and the take per hunter effort was 2.4 squirrels. Catahoula has one of the better

Catahoula GMA

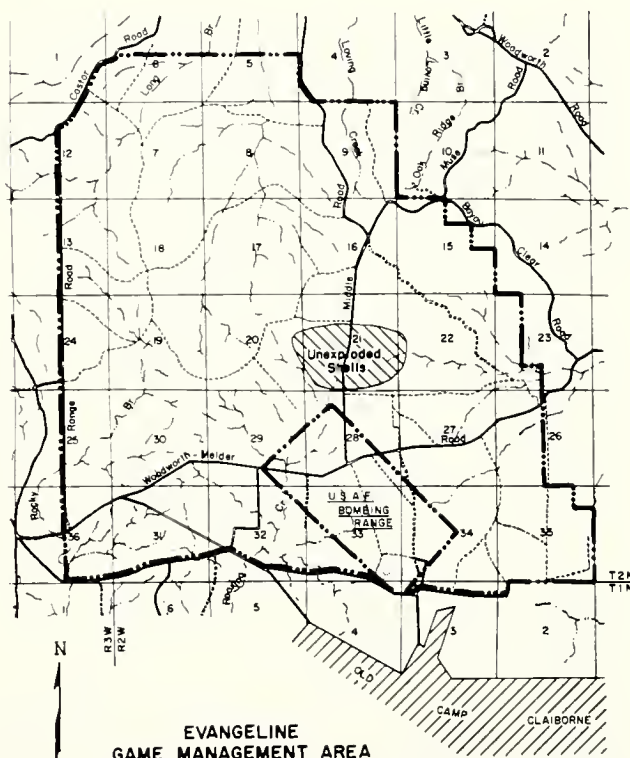
CATAHOULA GAME MANAGEMENT AREA



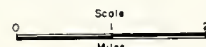
Evangeline Game Management Area

T. EARL DEEN
Area Supervisor

Another management area on U. S. Forest Service lands, Evangeline is 15,000 acres of piney woods located a short distance south of Alexan-



EVANGELINE
GAME MANAGEMENT AREA



LEGEND:



Don Sept., 1959

Evangeline GMA

dria in Rapides Parish. Forest cover is primarily second growth longleaf and loblolly pines with mixed hardwoods. Drainage is excellent with numerous small streams along which are found pure stands of hardwoods.

Each year, eight five-acre wildlife plots are planted with winter wheat to supplement the scant winter forage for deer. The matured grain is utilized by quail and doves. Other routine activities include fence and boundary maintenance, some necessary road work, mowing, patrolling, maintenance of the hunter camping area, and other odd jobs.

During this biennium, the four mile stretch of woods road used by hunters as the main entrance to the area was improved considerably. Prior to this time, several accidents had occurred and during periods of rainy weather road conditions held up hunter travel considerably. Through the cooperation of the U. S. Forest Service and the Rapides Police Jury, the Commission was able to make it into a first class gravel road. The road bed was widened, hills were reduced, fills were made, and culverts put in. Enough gravel was spread to make an all-weather road.

Managed squirrel hunts are held yearly on the area and a fair amount of hunters are attracted. Bag checks made each year indicate that the average kill remains virtually the same, about one squirrel per hunting effort. Archery hunts for deer are also held each year with only a few archers making use of this area for their sport. They made no known kills during this two year period.

Five day managed deer hunts are held annually and as on the other areas are for either sex deer until a certain number of animals are taken with the remaining days, if any, devoted to legal buck hunting. On this area, the figure selected was 125. It was not reached in either year. In 1964, it was presumed that nearby Alexander Forest drew many of Evangeline's hunters and that hunter concentrations did not reach a sufficient level at any time to provide the desired kill. This was not the case in 1965; hunter use increased and yet only eighty-three animals were taken. This area will be re-evaluated prior to the 1966 hunt. The range has apparently been reduced in its ability to sustain the deer population it had been carrying in the past. The pine forest is ageing and shrubby vegetation is being shaded out. The area is also heavily grazed by range cattle. In 1964, 1,430 hunting efforts resulted in a kill of sixty-two deer and in 1965, eighty-three animals were taken by 1,998 efforts.

Quail hunts are also held annually with reduced interest in recent years. Quail hunters enjoy watching their dogs work in the open understory but few birds are found.

Fort Polk Management Area

MARVIN DEASON

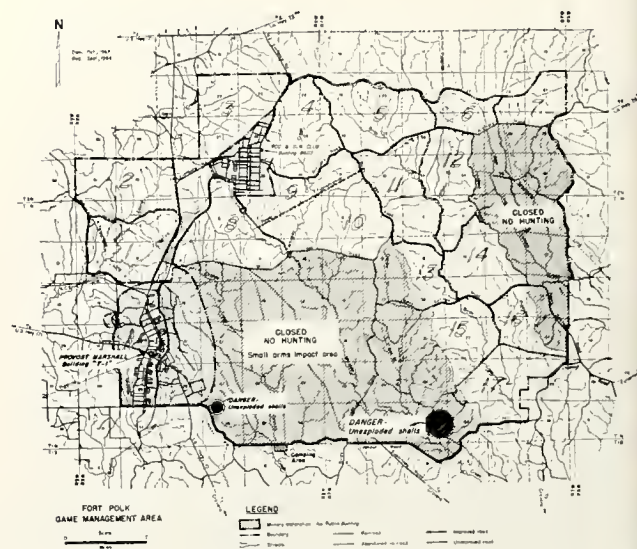
Area Supervisor

This area is located in central Vernon Parish and is available to the Commission through the cooperation of the U. S. Army and the U. S. Forest Service. The area is made up of about 52,000 acres of open and forested lands. It is characterized by gently rolling hills, high hilly ridges, and streams between the high ridges. Along the streams are found hardwood areas ranging in size from major stream bottoms to relatively small "bay galls". The hilly areas are either open or bear longleaf and loblolly pines intermixed with hardwoods as well as in pure stands. Pure stands of scrub oaks are also found in the hills.

Deer, squirrel, quail and doves attract many hunters to the area. Each year hunting pressure increases, particularly on deer.

A few small wildlife plots are planted each year, primarily to benefit quail. This year, a forty acre plot was fenced and planted with wheat. This particular plot was placed in the area of the black francolin release and is intended to be planted in such a manner that these birds will benefit from it. Other game species will also derive benefit from this plot and it will be later used for dove management.

An experimental release of pen reared black francolins is being made on this area. A conditioning pen about 50 ft. by 150 ft. and six feet tall was constructed on the area and 161 birds placed in it during the summer. Poultry wire was used for the walls of the pen and a top of the



Fort Polk GMA

same material was made so that the birds could not escape as well as to protect them from all predators. An electric fence charger was attached to the fence to further discourage predators. In the fall of 1965, a partial release of sixty birds was made. The remainder will be released in the spring of 1966. Current plans call for additional releases in this area. Signs of the released birds are seen in the immediate vicinity of the pen and game bird food is kept available for them. A release of turkeys was made following the same pattern as discussed for the francolins. These birds, when given to the Commission were purported to be desirable birds. However, they didn't turn out to be as wild as was expected and the outcome of this release is still in doubt. Three wild trapped gobblers were released later in an effort to give a better chance of establishing this game species. The older birds with some young have been noted.

Taking care of the penned birds, fence and boundary maintenance, patrolling, planting, bush-hogging and operation of managed hunts are the primary activities on the area.

Hunters are permitted to hunt any game in season with two restrictions. One, which applies only to deer hunting, is that they may hunt inside the management area only when the section of Vernon Parish surrounding the area may be hunted; second, hunters must secure a daily clearance from the military authorities. Incorporated in the clearance is the Commission permit. The numbers of quail and squirrel hunters making use of the area remains fairly constant but the area increases yearly in its attraction to deer hunters. During the three days of the either sex season, each hunter is checked in and out and it is possible to measure the hunting effort as well as the harvest. Other than these three days, clearances are issued for hunting all game species as well as fishing and a breakdown of the type of activity cannot be determined.

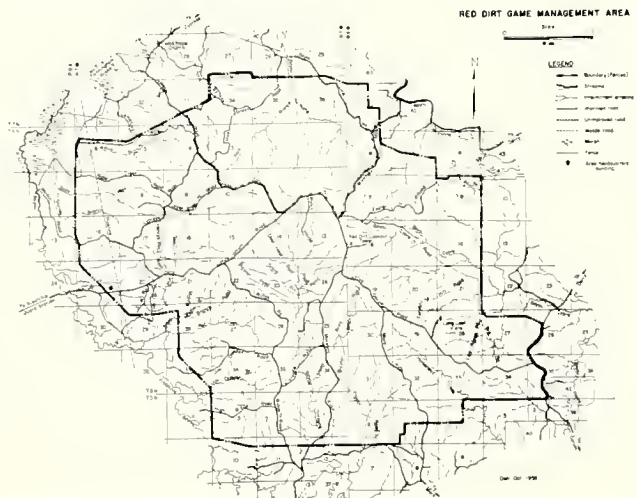
The hunting effort for the either sex season has practically doubled itself annually. In 1964, 1,531 hunting efforts were made with a kill of

ninety-three deer; in 1965, the efforts jumped to 3,103 with a harvest of 249. Spot checks of quail and squirrel hunters were made and the average quail hunter during the 1964-65 season took 3.7 birds per effort. The 1965-66 season has not been completed. Squirrel hunters enjoyed a greater success during the portion of the 1965-66 season that has been completed than during the past year. Last year they bagged 1.6 per effort while the current average is 2.6. An archery hunt was held for deer each year. In 1964 there were no known kills, in 1965, one deer was killed in this manner.

Red Dirt Game Management Area

H. C. BEASLEY
Area Supervisor

Red Dirt, located in central Natchitoches Parish, contains 38,000 acres of piney woods. The lands belong to the U. S. Forest Service and are part of the Kisatchie National Forest. The major portion of the area is made up of well drained, gently rolling hills but in spots sharply defined hills are found. Forest cover is mostly second



Red Dirt GMA



Black Francolin Gentle Release Pen.

growth longleaf pine in pure stands. Also on the hills other pines are found mixed with longleaf as well as occasional hardwoods. The several main streams and their numerous tributaries have hardwoods growing along their courses. Scrub oaks are found in pure and mixed stands along some of the ridges.

Excellent deer hunting, fair quail hunting, and a limited amount of squirrel hunting is available to sportsmen. Several attempts have been made to introduce turkeys with no lasting success. Each year numerous wildlife plots of varying sizes are planted to supplement natural foods. Wheat, brown-top millet, bahia grass, and common lespedeza are the plant species used. Doves and quail utilize the grains or seed produced and wheat is used heavily by deer during the winter and spring. This area is fenced and the maintenance of the fence as well as planting and mowing the wildlife plots takes up considerable time each year. In addition, woods roads are maintained, experimental deer research work is carried on, the boundary is maintained, various items of equipment are constructed or repaired, machinery is maintained, and managed hunts are supervised.

As on other areas, an archery season for deer, a quail season, squirrel season, and a gun hunt for deer are held. For all but the latter deer hunt, season permits are issued to all applicants. During the archery season for the past two years archers took two animals in 1964 and seven in 1965. Spot checks of squirrel hunters indicated an average success of one squirrel per hunter in 1964 and about the same in 1965. With the gradual maturing of the pine forest, quail hunters find this area less attractive each year. Bag checks in 1964 did show an average of 2.7 birds per hunter which is not too bad. Deer hunters continue to come to Red Dirt, at least for the either sex hunt. During both years of this report, the cut-off number for either sex hunting was 250 animals. This number was reached or exceeded in two days in 1964 and on the first day of 1965. For the five day period, 3,121 hunters took 290 animals in 1964 and 258 deer were taken as a result of 3,274 efforts in 1965. The majority of the hunts were made the first two days of each season after which both hunting efforts and kill were negligible.

Sabine Game Management Area

JOHN I. GENTRY
Area Supervisor

Located a few miles south of Zwolle in Sabine Parish, this area consists of about 12,000 acres. Forest cover is about half loblolly-shortleaf-hardwoods and half hardwoods. The northern piney woods section is well drained by numerous small intermittent streams while drainage is poor

in much of the southern section. Extensive water and willow oak flats are found in the southern section. Squirrel and deer hunts are held on this area with the managed squirrel hunt attracting the most hunters. Spot checks indicated an average bag of 2.1 squirrels per effort in 1964 and 2.0 in 1965. While they didn't take a single deer, archers came to this area for the first time in 1965 for the special archery season. They reported seeing a number of deer and promised to be back next year. Needless to say, archery hunting for deer has been allowed for several years on the area. Hunters continue to disregard the managed gun hunt for deer also, in fact, fewer efforts were made in 1965 than in 1964. Of interest is the fact that the best average for a single day of all the management hunts in this District was recorded here. Seven deer were taken one day with only forty-two hunters in the woods for an average of six hunting efforts per deer taken. In all the years of either sex shooting, all the five days of the deer hunt on this area have been for either sex as the cut-off number of 100 has never been attained. In 1964, 540 hunter efforts were made with a kill of twenty-six deer; in 1965, 475 hunting efforts harvested twenty-four animals. Aside from the supervision of the managed hunts, activities are limited to boundary and woods road maintenance, patrolling and predator trapping. The Area Supervisor assists on other management areas considerably.

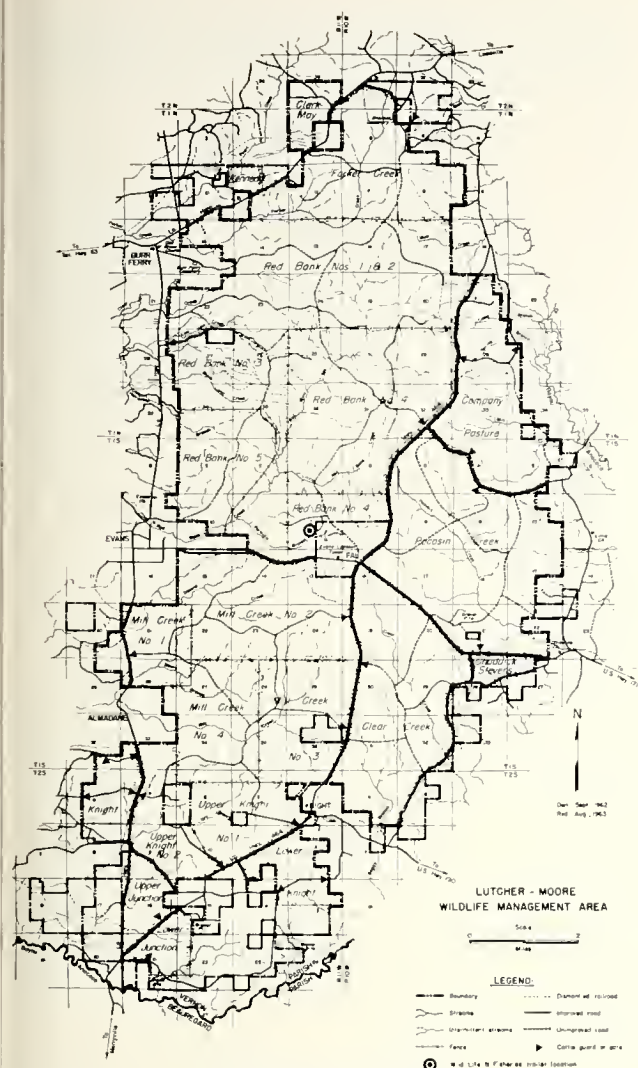
Three wild trapped turkey gobblers and four hen turkeys captured on one of the other Game Management Areas were released here in the spring of 1965. Shelled corn has been kept available near the release site at all times since they were placed on the area. Signs of these birds have been seen from time to time as well as evidence of limited reproduction.

This area is leased free of charge to the Commission by the private and industrial landowners.

Lutcher-Moore Game Management Area

WOODROW SMITH
Area Supervisor

The previous management areas discussed have been maintained through Pittman-Robertson funds. The costs of operation of this unit are borne entirely by the Wild Life and Fisheries Commission. The major landowner is the Lutcher and Moore Lumber Company, with smaller acreages belonging to Kirby Lumber Company and Southwestern Improvement Company. The entire 55,000 acres are leased to the Commission without charge. Virtually all of the area except stream bottoms is forested with slash pine plantations of various ages. This section of Vernon Parish was originally forested with longleaf pine that was logged in the 1930's. The many small



Lutcher-Moore GMA

branches and streams found here have good stands of mast bearing hardwoods.

Quail and squirrel have been legal game here for several years and annually attract many hunters. During the 1964 quail season, quail hunters enjoyed phenomenal hunting due to the extensive controlled burns on the area. While a few small wildlife plantings were made, the excellent quail populations were a direct result of the burning program of the principal landowner. The controlled burns removed the heavy rough found in piney woods and permitted natural legumes and other favored quail food species to come in. With the excellent food conditions the quail population increased considerably. The 1964 and 1965 squirrel seasons produced an average bag of about three and one-half squirrels per hunting effort.

Deer hunting, with season permits, was allowed for the first time since 1959 during the legal season of 1965. Only legal bucks could be taken and during the first half of the season, a known twenty-two deer were taken. As hunters were not checked in and out it is quite likely that several

more were harvested. Of the known kills, several were checked and found to be large deer, above the average for the piney woods. This was to be expected as this is a young deer herd and plenty of high quality food is present. It is hoped that this herd will be kept within the limits of its range as far as natural foods are concerned and will continue to produce fine animals. Archers did not make any known kills.

On this area, like the others, routine activities include boundary and woods road maintenance, some wildlife plantings, patrolling and predator trapping.

DISTRICT IV

DEWEY W. WILLS

District Supervisor

DAVID F. TAYLOR

District Biologist

HOWARD R. BLOUNT

Biological Aide

The following parishes make up District IV of the Fish and Game Division: Madison, Tensas, Concordia, Caldwell, Franklin, LaSalle and Catahoula. Headquarters for the district is located on Lake Concordia, near Ferriday, Louisiana. This district has a game management area located in portions of each parish comprising the district. They are: Chicago Mills, 102,000 acres (portions of Madison, Tensas and Franklin Parishes); Saline, 60,000 acres (portions of LaSalle and Catahoula Parishes); Concordia, 10,000 acres; and Caldwell, 12,000 acres.

The major activities of District IV consist of development, maintenance, and management of the game management areas. Other activities consist of doing research, as directed by the various research study leaders; conducting waterfowl research on Catahoula Lake; giving lectures and talks to schools and various other groups; and giving assistance and guidance in wildlife work to sportsmen's groups and individuals.



DEWEY W. WILLS

District Supervisor

Caldwell Wildlife Management Area

WELSH LIVELY Area Supervisor

The Caldwell Game Management Area, consisting of approximately 12,000 acres, is located in southeastern Caldwell Parish. With the exception of 4,000 acres which is fenced to exclude cattle, this area is open range. Within the fenced area rank growths of vegetation, both woody and herbaceous, have resulted. Following this rank growth, which has created excellent habitat, is a growing deer herd. The first sound deer management program was initiated on the area in 1963 when an any sex season was conducted on the area. However, the 1964 and 1965 seasons were for bucks only.

Squirrels. The area was open to squirrel and rabbit hunting during the 1964 season, and again during the 1965 season. Hunters were mailed permits which were valid for the entire season.

Spot checks during this hunt revealed that hunters experienced only a fair season on the area. In 1965 spot checks indicated that success was much better than that of the previous season.

Deer. (Gun Hunt) The Caldwell Game Management Area was opened for a five day managed hunt during the 1964 season. The season originally set was for a five day "any deer", or until 150 deer were killed, with the remaining days being open for "bucks only" hunting. However, the season was changed to a five day "bucks only" season, and 37 bucks were killed, for 641 hunter effort.

The following is a daily breakdown for the 1964 season:

Date	Hunter Effort	Kill
November 27, 1964	227	16
November 28, 1964	189	11
November 29, 1964	93	3
November 30, 1964	70	3
December 1, 1964	62	4

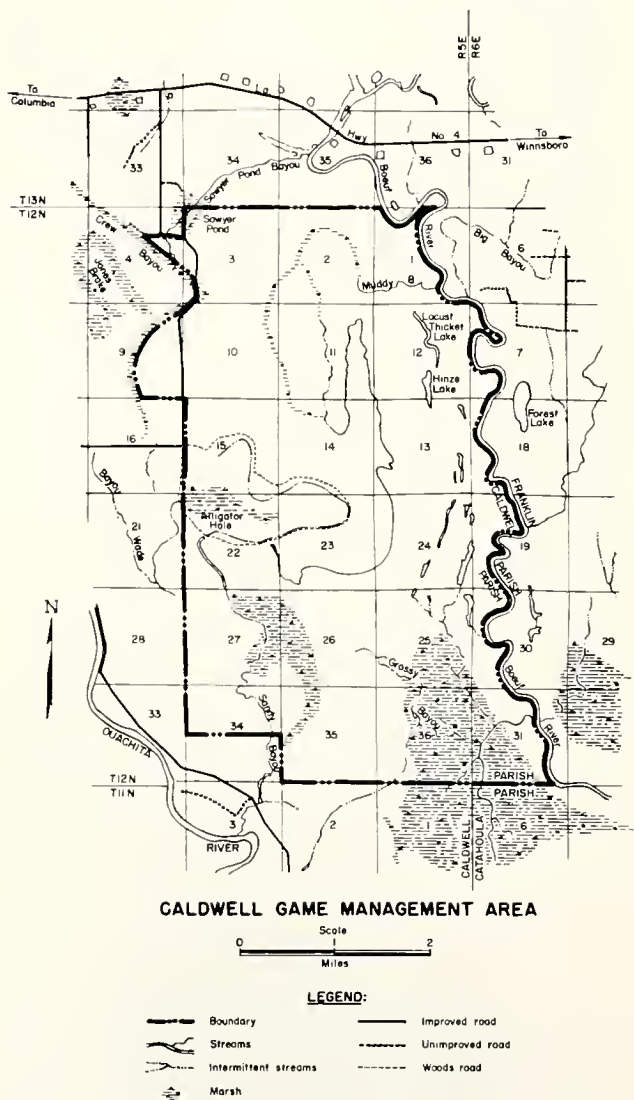
During the 1965 season there were two five day seasons held on the Caldwell Area. The first five days were from November 26, to November 30, 1965. This hunt was on a check-in and check-out basis with a daily permit required. During this season 57 deer were taken for 1034 hunter efforts. The second five day season was held from December 18, to December 22, 1965, and a season permit was valid. During this five day period spot checks were made which indicated that there was considerable interest in the last hunt; however, the kill was low.

Deer. (Bow and Arrow) An archery season was held on the management area during the regular statewide hunt for both 1964 and 1965. Spot checks during the seasons indicated considerable hunting effort and interest during both seasons, however, the reported kill was low. It is believed that interest in archery hunting is on the increase on the Caldwell Game Management Area, as well as other areas in the state.

Miscellaneous Activities. The boundary line was maintained in good shape, which consisted of painting and replacing boundary markers where needed, existing food plots were mowed regularly, and fences repaired where needed. The major hunter access road was maintained and reworked with motor grader. Forty linear feet of culverts were placed in this road in the summer of 1965.

A trapping season was held on the area from December 10, 1964, to March 20, 1965. During the period seven permits were issued, and approximately 100 raccoons and 15 mink were trapped.

The Caldwell Game Management Area will continue in importance as habitat is improved on the area, and as our management and development program increases.

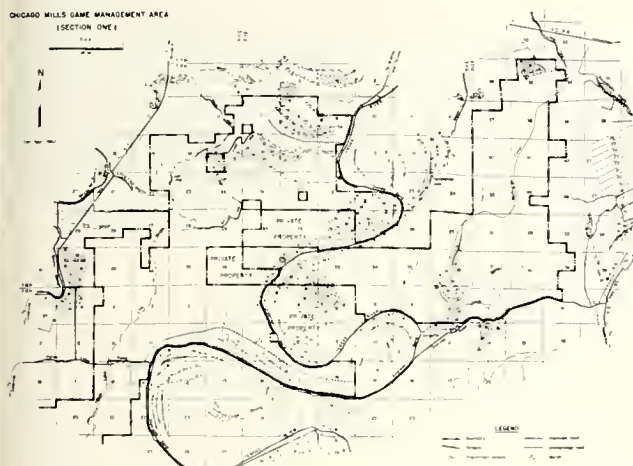


Caldwell GMA

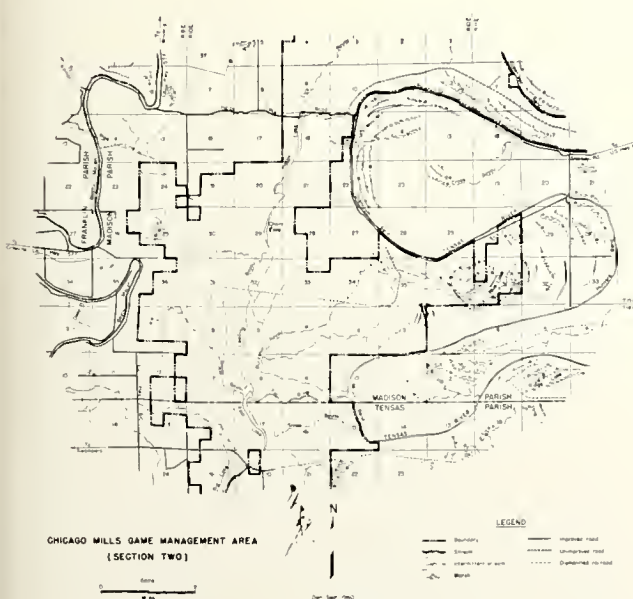
Chicago Mills Game Management Area

JIM PERRIT
and
R. T. WILLIAMS
Area Supervisors

The Chicago Mills Game Management area, a 102,000 acre tract, occupies portions of Madison, Tensas and Franklin Parishes. The area is leased without fee from the Chicago Mill and Lumber Company. For administrative purposes, the area is divided into two segments, each consisting of approximately 50,000 acres. A game management area supervisor and one refuge warden is assigned to each area. Their duties, in addition to routine patrol, consists of maintenance of over 285 miles of boundary lines, upkeep of access road, assisting in all managed hunts, and other necessary



Chicago Mills GMA (one)



Chicago Mills GMA (two)

duties required for the efficient operation of the area.

Squirrel, rabbit and deer seasons were conducted on the area during the period covered by this report. Following is a brief resume of these hunts.

Squirrel and Rabbit. The game management area was opened to squirrel and rabbit hunting beginning October 3, and closing October 31, 1964. Hunter bag checks were made at different intervals, which revealed that of the 509 hunters checked, 726 squirrels were killed for a success of 1.4 squirrel per hunter effort. The squirrel hunt was conducted by mailing applicants a season permit.

The area was open to squirrel and rabbits again in 1965, from October 2nd, through October 31st. Once again applicants were issued a permit valid for the season. The 1965 season was much more successful than the previous year, as revealed by spot checks made by District personnel. A total of 585 bag checks were made, and 1,545 squirrels were checked during this season. This averaged 2.6 squirrels per hunter effort.

Deer. (Gun Hunt) A five day "bucks only" hunt was conducted on the Chicago Mills GMA from November 27, through December 1, 1964. The hunt was managed in such a manner that all hunters were checked in and out of the area daily. During the five day period there was a total of 256 deer harvested. The hunter success ratio for this hunt was one deer killed for every 36.1 hunter effort.

During 1965, the area was opened for two five day periods. The first period opened November 26 and went through November 30, 1965, and a daily permit was required for this hunt. This

season produced the highest kill ever for the area. A total of 12,867 hunter efforts were made and a total of 1,617 deer were killed.

The following is a daily breakdown of the 1965 season:

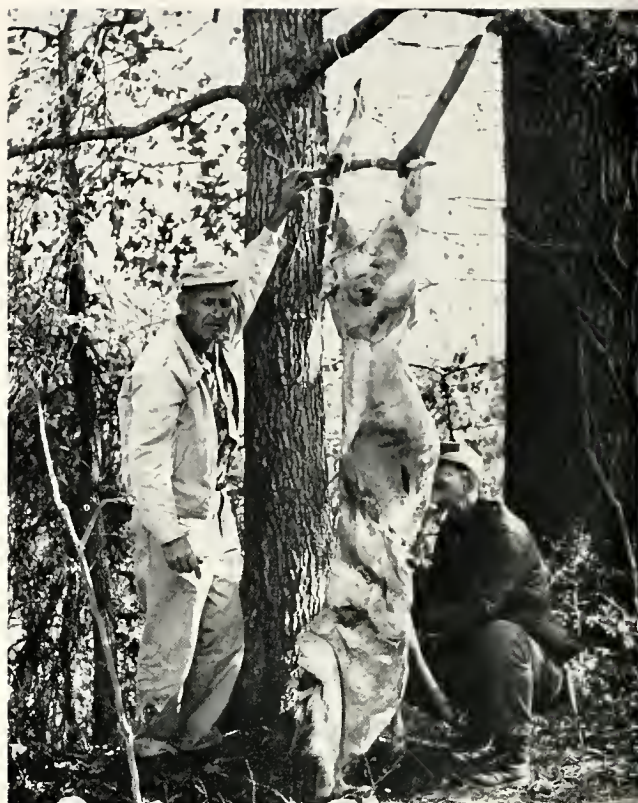
<i>Date</i>	<i>Hunter Effort</i>	<i>Kill</i>
November 26, 1965	6,672	1,466
November 27, 1965	3,958	99*
November 28, 1965	1,307	25*
November 29, 1965	486	10*
November 30, 1965	444	17*
TOTAL	12,867	1,617

*Bucks only.

The second deer hunt was held from December 18, through December 22, 1965. This hunt was for bucks only and hunters could hunt the area on a season permit. Spot checks revealed that the hunting pressure was small as compared to the first season held on the area; however, there was enough interest for it to be considered a success. Most of the hunting pressure occurred on opening week end and dropped off sharply the last three days. Approximately 50-75 bucks were taken during this five day hunt.

Deer. (Archery) This area was opened along with the statewide archery season during 1964 and 1965. Hunters were issued a season permit, upon request, from any of the district offices. The interest in this sport is growing each year. The bow hunting pressure of 1965 was almost double that of 1964.

Turkeys. Two sixteen day seasons were held on the Chicago Mills GMA during the spring of 1964 and the spring of 1965. These seasons were



Skinning out deer after a successful hunt.

held in conjunction with the statewide seasons. Hunters were issued permits by mail from the Ferriday office. Hunter participation of the area was good and approximately 50 gobblers were bagged during the 1964 season, and approximately 55 were bagged during the 1965 season.

Miscellaneous Activities. Parking areas for hunter owned vehicles were constructed along the main access road to Newlight overnight cabin. This consisted of spreading 75 yards of pit run gravel over three parking areas. These areas were utilized heavily during the managed hunts.

A camping area was established on the area near Tendal. It is complete with a water pump and toilet facilities. This camp area was used by approximately 500 hunters during the 1965 season.

Several miles of jeep roads were brushed out with a D7 dozer during this period. This will provide more hunter access to the area. In addition to this, several miles of woods roads have been cleared of brush at different intervals through the year.

Approximately 200 miles of boundary lines were kept open by the use of Ford tractors with rotary mowers. In addition, the remainder of the boundary lines, plus several miles of river boundary, were painted and signs replaced where needed.



Successful deer hunters breaking camp at Chicago Mills Game Management Area.

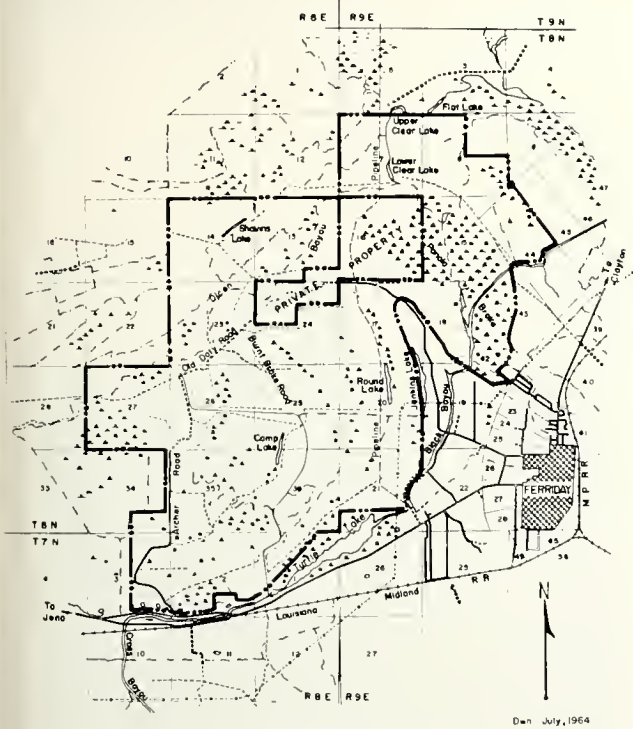
Twelve permit and checking stations were maintained, these required painting and the replacement of some window glasses. Two new permit stations were built and used during the 1964 and 1965 seasons.

A trapping session was held on the area from December 10, 1964, to March 20, 1965. During this period 22 permits were issued, and approximately 400 raccoons were trapped.

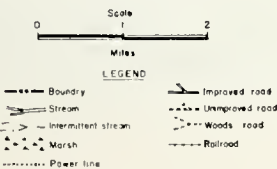
Concordia Game Management Area

QUENTEN MATHEWS
Area Supervisor

The Concordia Game Management Area, consisting of approximately 10,630 acres, is located in the northwestern portion of Concordia Parish. This area was leased in May, 1963, from the following companies and individuals: Panola Land and Development Company (7,400 acres), Fisher Lumber Corporation (1,030 acres), James C. Cochran (960 acres), and Mrs. Mary Bullis (1,240 acres). The lease is for a ten year period without fee.



CONCORDIA
WILDLIFE MANAGEMENT AREA



Concordia GMA

The land use is primarily for timber production. Three fields, consisting of approximately 300 acres, are being leased out and farmed at present. These fields are located on lands owned by Panola Land and Development Company, and this company plans to plant these fields in hardwood seedlings within the next year.

Development and maintenance during the past two years has consisted of boundary road construction and habitat improvement. Approximately 35 miles of boundary lines were established, painted, and four boundry markers erected.

There have been five miles of road constructed with bulldozers and motor graders. This road has been maintained during the period covered by this report by use of tractor and pull grader. Several miles of woods roads were clipped with a rotary mower for better hunter access. One hundred and eighty linear feet of concrete culverts were placed in newly constructed roads. Three cattle guards were placed on major access roads. A bridge was constructed across one of the major drainage canals transacting the area.

Salt licks were established and maintained during the past two years and three abandoned oil well sites were mowed to maintain them as "opening" on the area.

This area was open to squirrel and rabbit hunting during the 1964 and 1965 seasons. During 1964 the area was open 55 days for squirrel and rabbits, while in 1965 the area had a 54 day equirrel and rabbit season. Both seasons were good on the area, with the 1965 season rating as the better of the two.

In April, 1964, 31 deer were released on the area. The season has been closed for the past two years in order to let this herd build up. The area is capable of supporting a good deer herd and should furnish excellent deer hunting within the near future.

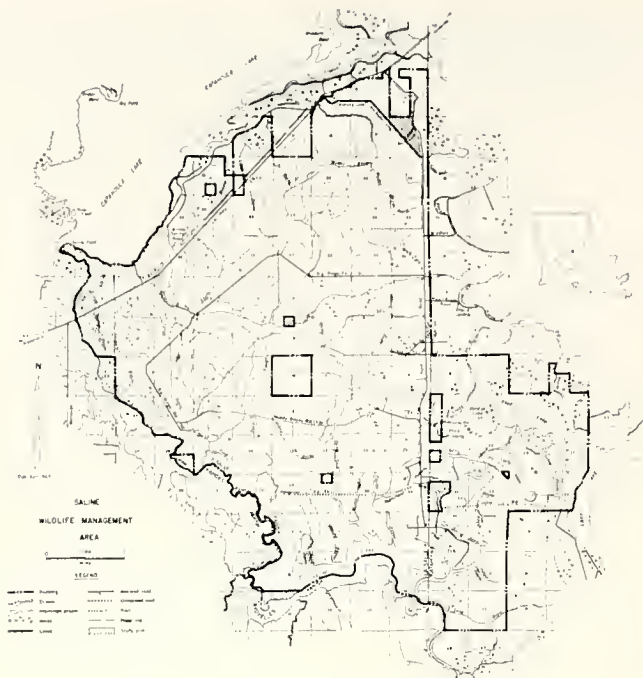
Miscellaneous Activities. In February, 1965, three gobblers were released on the Concordia Game Management Area. Stocking schedule calls for three gobblers and six hens for this area, and it is anticipated that the hens will be available by late winter or early spring.

The area was open for the trapping of fur bearing animals during the 1964-65 trapping season. The area has a high raccoon population; however, trapping interest was low and not many animals were trapped.

Saline Wildlife Management Area

CHARLES WILEY
Area Supervisor

The Saline Wildlife Management Area is located in portions of LaSalle and Catahoula Parishes. Approximately 50,000 acres lie in the



Saline GMA

southeastern part of LaSalle, while approximately 10,000 acres lie adjacent to this tract in Catahoula Parish. The 50,000 acre tract was purchased by the Louisiana Wild Life & Fisheries Commission in March, 1964, and the remainder of the tract was purchased in September, 1964.

Money for the purchase, amounting to \$29.00 an acre, came from the Russell Sage Foundation.

Timber types consist of mixed bottom land hardwood, overcup, bitter pecan, nuttall oak, water oak, willow oak, ash, and elm. It has the potential of being one of the state's finest game management areas.

Saline is a backwater area and provides access to some of the finest fresh water fishing in the state. A channel is planned that will extend from Catahoula Lake to Black River; however, the backwater fisheries in the Saline-Larto Lake Complex will remain south of the channel and levee, thereby continuing the spring overflow.

Following is a brief resume of what has been done, and future plans for the Saline Wildlife Management Area:

The boundary has been completely surveyed (except for a few miles) by licensed surveyors. This line has been painted and boundary signs placed at various intervals. A 40 foot right-of-way has been pushed out by Central Louisiana Power & Light Company for the installation of an electric line. This right-of-way follows the boundary line for approximately seven miles, and it is desirable to push out the remainder of the land boundary line to a width of at least 20 feet which would clearly define the boundary line.

A 300 acre area has been fenced against hogs and cattle. The purpose of this study area is to

determine how rapidly this fenced area will re-vegetate after the hogs and cattle are excluded.

DEVELOPMENTAL POTENTIAL

Waterfowl. Excellent opportunities for waterfowl development are available on the Saline



Construction of fence around study area on Saline Game Management Area.



Clearing of dove food plot on Saline Game Management Area.

Wildlife Management Area. Future plans call for creating impoundments and green-tree reservoirs. This area, with its proximity to Catahoula Lake (which winters a high duck population), should furnish excellent waterfowl hunting in the future.

Deer. A nucleus deer herd is present on the area, and this herd will increase through protection from poachers, free ranging dogs and the removal of free ranging cattle and hogs. Also, the northern portion of the wildlife management area will eventually be protected from spring overflows which will result in the range providing a better habitat for deer. However, the present carrying capacity on the area is low, due to the spring overflow and over grazing by livestock.

Squirrels. This area has been heavily logged for the past several years and presently supports a fair squirrel population. However, as the timber type improves over the years, habitat will improve and the squirrel population will increase. There was a squirrel hunt held on the area from October 3, through November 24, 1965. Spot checks on the area indicate the kill was low to moderate.

Turkeys. Six gobblers were released on the area during 1964, and it is anticipated that a stocking of hens will be made in the very near future. The most detrimental factor affecting turkeys on this area is the spring overflows; however, with the installation of the Catahoula Lake diversion channel, the northern portion of the wildlife management area will be protected by a levee. It is believed that this area will support a wild turkey population and that hunters should be reaping the benefits of this program in the not too distant future.

Doves. A development program aimed at providing dove hunting on the area has been initiated. Four 10 acre food plots are being cleared on the wildlife management area. These plots will be planted to some type of dove food and it is anticipated that these plots will be very attractive to doves. This development program should be completed and available for shooting during the 1966 season.

Boat Ramp and Camping Area. A boat launching ramp is under construction that will, when completed, provide access to the entire Larto-Saline complex. This ramp should be available to the public by spring of 1966. It is also planned to construct a camping site adjacent to the boat launching site. This will provide a place for outdoor enthusiasts to camp free of charge on the wildlife management area.

Purchase of the Saline Wildlife Management Area is a great step forward in meeting the recreation needs of the growing population.

DISTRICT V

JACK A. SIMS
District Supervisor

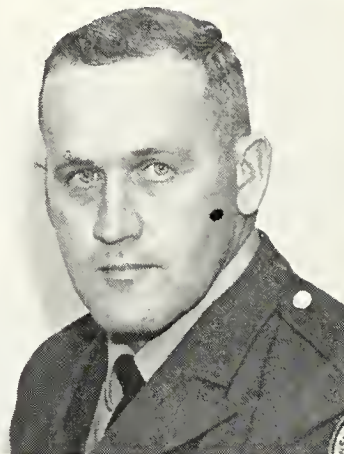
HUGH A. BATEMAN, JR.
District Biologist

Exotic Game Propagation Unit

J. T. RAIFORD
Caretaker

The purpose of this unit is to raise exotic game birds that are being studied in Louisiana. This method of production is being used since all species being studied come from foreign countries and it is almost impossible to secure enough wild trapped birds to release on the study areas.

The present unit is located on the DeRidder Airport adjacent to the District V office. Ten



JACK A. SIMS
District Supervisor

acres of land have recently been purchased east of DeRidder and a new unit is being established and at the time of this writing, the new brooder house is almost complete. Present plans call for placing the breeding stock on the new area prior to the 1966 laying season. With this new facility, more birds can be produced and this should shorten the period needed to determine if a certain species can be established in Louisiana.

We are presently producing four species of birds for liberation. These species are: (1) black francolin (2) red junglefowl (3) bamboo partridge (4) Japanese green pheasant. Following is a table showing the number of birds produced during the 1964 and 1965 breeding seasons. The western Iranian pheasant was produced during this period, but at the end of the 1965 breeding season all young birds and breeding stock was liberated. Since we have limited facilities, it was decided that work on this species would be terminated for the present.

PRODUCTION—1964 & 1965

<i>Species</i>	<i>Year</i>	<i>No. Hens</i>	<i>Eggs Laid</i>	<i>Average Per Hen</i>	<i>Percent Fertile</i>	<i>Chicks Hatched</i>	<i>Chicks Raised</i>
Black francolin	1964	36	624	17.3	75	395	254
	1965	74	1,501	20.3	79	916	503
Red junglefowl	1964	20	744	37.2	65	318	267
	1965	26	686	26.3	73	342	234
Bamboo partridge	1964	3	143	47.7	54	60	49
	1965	17	254	14.9	72	135	81
Japanese green pheasant	1964	6	347	57.8	75	177	166
	1965	16	552	34.3	72	244	170
Western Iranian pheasant	1964	6	125	20.8	60	49	35
	1965	16	134	8.37	75	53	37

The release information on these birds will be discussed by the Exotic Game Study Leader.

Gum Cove Black Francolin Release Area

This area is located in northwest Cameron Parish on the R. A. Moore Ranch. A total of 311 wild trapped birds from India were released on this area during 1961 and 1962.

From information gathered during the past three years, a good population of francolin is present on the area. The birds have spread several miles from the original release site, but populations in this fringe area are not as high as that one the original release site.

Future plans for this area will be discussed by the Exotic Game Study Leader.



A calling black francolin male at Gum Cove. Males call from elevated perches frequently between March and September.

Fenton Japanese Green Pheasant Release Area

Approximately 125 birds were released on this area during 1964 and 1965. This area is located in northwest Jefferson-Davis Parish south of Fenton. It is primarily a rice field-pasture type area.

Occasional birds are seen by personnel and field workers report seeing birds during agricultural operations. Two broods of young were reported

during the spring of 1965. However, these were not confirmed by Commission personnel.

During the coming year, an effort is going to be made to release a larger number of birds. Other states have found that in order to properly test a pheasant release, at least 200 birds per year should be released for three consecutive years.

DeRidder Airport Bamboo Partridge Release Area

This area is located on the west side of DeRidder Airport. The land type is old fields and timber land grazed by cattle.

No birds have been released as yet, but a total of 64 birds are now in the conditioning pen on the release site. A portion of these birds will be released in January and the remainder in late February or March.

This will be the first release of bamboo partridge made in Louisiana.

West Bay Wild Life Management Area

E. E. GARLINGTON
Area Supervisor

The operation of this area during the period covered by this report concerns mostly maintenance of roads and improvements and managed hunts. Each species hunted and success of hunt is covered in the following:

Squirrel and Rabbit. During the 1964-65 season there was a 29 day hunt and a 16 day hunt during the 1965-66 season. The hunters were allowed on the Area by season permit. The Area Supervisor and other personnel conducted spot checks of hunters to determine hunters success. From a comparatively small sample, the success was approximately two squirrels per effort in 1964-65 and 2.5 in 1965-66. Very few rabbits were taken since the use of dogs for rabbit hunting was not allowed.

Quail. There was a 14 day quail season in 1964-65 and a 46 day season in 1965-66. This hunt was conducted on a season permit basis. There are no figures available on the quail kill,

Trapping. Beginning with the 1964-65 trapping season, persons who had purchased trapping licenses were allowed to trap the Area. Prior to trapping, the trapper had to secure a permit from the District office. Before setting his traps, the trapper was required to contact the Area Supervisor giving him the location of his trap line and the number of traps on his line. At the close of the trapping season the trapper was required to submit a summary of his catch made on the Area to the Area Supervisor.

Below is a table showing permits issued and catch. Due to the fact that the 1965-66 season has not closed at the time of this writing no catch data for this season can be included.

	1964-65	1965-66
Permits Issued	12	4
Number Animals Trapped		
Coon	62	-----
Mink	9	-----
Opossum	8	-----
Skunk	1	-----
Gray Fox	3	-----

DISTRICT VI

J. B. KIDD
District Supervisor

W. A. GOUDEAU
Biological Aide

Thistlethwaite Game Management Area

SQUIRREL HUNTS

Managed squirrel hunts were conducted on the Thistlethwaite Game Management Area for the 7th and 8th consecutive years during the 1964 and 1965 seasons.

Prior to both years' hunting, hurricanes passed through the area which no doubt limited hunter success. Fallen debris made walking in the area difficult. The acorn drop was also premature



J. B. KIDD
District Supervisor

which caused squirrels to resort to ground feeding thereby reducing the still hunting chances at bagging squirrel. Hunters in 1964 killed a total of 4417 squirrels for an average kill per hunting effort of 2 squirrels. In 1965 a total of 3735 squirrels were harvested from the area. It is interesting to point out that the November hunt in 1965 was the best experienced on the area with success equal to that attained in October.

A COMPARISON OF HUNTER SUCCESS

Year	Number Hunts Made	Total No. Squirrels Killed	Average Kill Per Hunting Effort
1964			
Oct. 3-18	1,826	3,856	2.1
Nov. 7-15	342	563	1.6
1965			
Oct. 2-17	1,465	2,871	1.9
Nov. 6-14	461	864	1.9

HOG CONTROL HUNTS

An eight day hog control hunt was allowed on the area in January, 1965. During the period 535 hunting efforts were made which resulted in the killing of 31 hogs. During the 3 day managed deer hunt in November, 1965, hogs were allowed to be killed. Only one hog was removed from the area. It is believed that this annual hunting of hogs has greatly reduced the number thereby allowing more acorns for use by squirrels, deer and turkey.

MANAGED DEER HUNT

For the first time, since stocking 5 years previous, a managed deer hunt was granted on the Thistlethwaite G.M.A. The area was opened 3 days to "bucks only" hunting. Hunter participation was poor and resulted in killing only one deer. This low kill is not indicative of the deer herd present as not more than 50 hunters were present on the area at any one time during the three day period. Daily permits issued were 89, 79 and 41 with a grand total of 209 for the three day period. It is believed that the deer herd in the area is at a huntable size and annual harvest should be allowed to keep the herd from over populating the area. Past information gathered from management area hunts showed that reasonable kills are made where "any deer" hunts are granted.

JUNGLE FOWL AND TURKEY RELEASE

A total of 110 red jungle fowl have been released on the area during the two year period. No records of nesting on the area have been reported. However, some birds have been observed to remain on the area from one year to the next and it is hoped this flock will establish itself on the area one day as another game bird for Louisiana hunters.

A horizontal scale bar with markings at 0, 1, and 2 miles. The word "Scipio" is written above the bar, and "Miles" is written below it. A vertical line marks the position of Scipio at approximately 1.2 miles from the 0 mark.

LEGEND

 Improved road  Unimproved road
 Levee  Boundary
 Streams  Intermittent streams
 Swamp  Trail

Own Jan, 1963

Grassy Lake GMA

Eighteen wild trapped turkeys from Florida were released on the area in January, 1965. No reproduction was seen in the spring of 1965, but at least 11 birds have been seen consistently on the area up to the completion of this report in December 1965. It is believed that these 11 birds will be the nucleus for establishing turkey on the area. The birds observed appear to be in excellent physical condition and some reproduction should begin in the spring of 1966.

FENCING

During the summer of 1965 a 500 acre enclosure was erected and completed. The purpose of this fencing, which excludes cattle, is to grow more deer browse and allow the turkey and jungle fowl secluded nesting cover. If the landowner consents, more such blocks of woodland will be fenced in the future.

Grassy Lake Public Hunting Area

This 26,000 acre area is open to the public on a year round basis without permits. This fine hardwood area has a sizeable deer herd, an adequate supply of squirrels and rabbits and offers some of the best bass and bream fishing in the state in its many bayous and lakes. While there have been no account records kept of hunter and fishing use on the area there are many sportsmen who annually make profitable hunting and fishing ventures in this vast area.

St. Landry Parish

PHEASANT RELEASE

Forty-seven Western Iranian pheasants were released north of Melville in October of 1965. These birds, native to Pakistan, were held in conditioning pen for a 2½ month period prior to release. Since the release, 8 known deaths have been confirmed in the area. Recent sightings of released birds indicate that those remaining are in good physical condition and are now utilizing food found in the fields.



Typical of some of the open waters of the Grassy Lake G.M.A. which although, famed for its fishing, also provides good waterfowl, deer, and squirrel hunting.

DISTRICT VII

HENRY D. ROBERTS
District Supervisor

Supplemental Quail Food Plantings on Public Access Lands

This is the continuation of a project initiated in the spring of 1957, in Tangipahoa Parish. Thirty-eight plots of approximately one-half acre each were fenced to protect them from cattle grazing, since they are located on open range in the dairying section of southeast Louisiana.



HENRY D. ROBERTS
District Supervisor

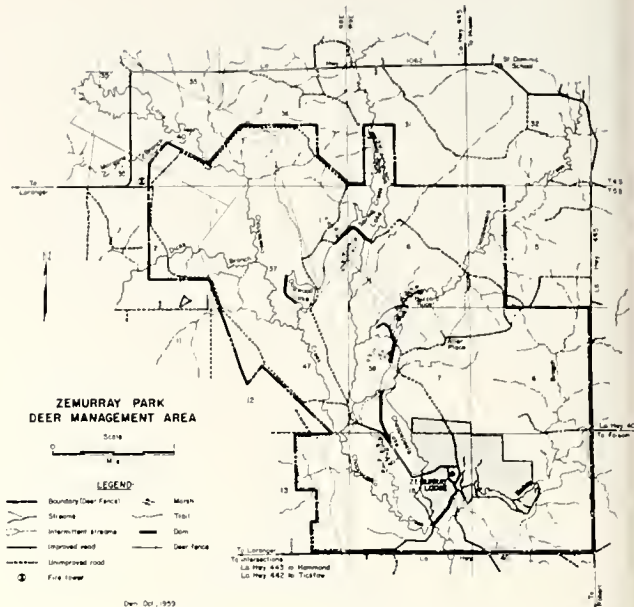
A portion of each plot was planted to lespedeza bi-color, a portion to brown-top millet (or, in some cases, to soybeans or cowpeas) and the remainder is left as a "rough" for nesting and immediate escape cover. The brown top is seeded early in the spring to insure a ready source of food for the young birds. These plots are not maintained with any expectation of increasing greatly the quail population; they are designed to supply an early source of food for the young birds in late spring and early summer, and to concentrate the birds during open season for the hunters.

Zemurray Deer Management Area

LLOYD C. CUTRER
Area Supervisor

MANAGED HUNTS

The managed hunts for either sex deer in 1964 took place on Dec. 2, 3, and 4, with an average of 165 hunters per day participating (out of 200 permits per day which were issued). They took thirty-seven deer during the three day hunt, seventeen of which were bucks and twenty does. The largest was a 2½ year old buck, four points, and weighing 156 lbs. Other



Zemurray Park Deer MA

than one exceptionally old doe they were in good condition.

In 1965 the three day hunt (again for either sex deer) was held on Dec. 6, 7, and 8. Hunter participation dropped to an average of 152 hunters per day as compared to 165 per day in 1964 (still from 200 permits per day). Thirty-two deer were killed consisting of 16 bucks and 16 does. Two 8 point bucks were killed, the live weight of one being 160 lbs. and the other 135 (both were 3½ year old deer). Body condition, generally speaking, was rather poor. This quite probably resulted from storm damage to vegetation from the hurricane, to drought conditions which prevailed throughout most of the summer and fall (even the live oaks, which rarely fail to produce mast, failed this year), and to girdling of some of the hardwoods which might normally have produced a little mast.

RANGE CONDITIONS

The browse species are showing a marked recovery from the over-browsed condition of 1959-60 when these hunts originated. Considerable green briar is to be found now, at an available height, as well as yaupon, dogwood, native azalea, honeysuckle and several others. Antler production, though still slight seems to be merely dwarfed rather than dwarfed as well as ragged and unsymmetrical.

LEASE ON AREA

Expiration date on the lease was December 13, 1965. A conference with the Zemurray attorney resulted in assurance that the lease would be renewed for another fifteen years, plus the possibility of expanding the area by another ten or eleven thousand acres.

DEER RELEASES

A release of 22 deer (15 does & 7 bucks) was made on April 7, 1964 just east of the Roberts community. These deer were from the Delta Refuge, and were taken by air boat rather than by trapping. In spite of severe harassment by dogs the year around, these seem to be doing reasonably well.

In February of 1965 there were 28 deer released in the vicinity of the town of Amite, in Tangipahoa Parish. The release site is the Tangipahoa River bottom to the east and south of the town of Amite. One of the bucks was in bad shape and died immediately after release. There is a dog problem in this area, also, but the release is still doing rather well; another release of 7 deer was started in the Devil's Swamp just north of the Baton Rouge city limits. These seven were taken by use of tranquilizer mixed with bait; two of these failed to make it, probably due to the lack of knowledge about handling them after they were tranquilized.

On Camp Villerie, in St. Tammany Parish north of Slidell, 24 Fallow deer from Hodges Gardens were released in March, 1965. The area is under fence and contains about 1900 acres. This release was made with the intention of hunting it only with bow & arrow or other primitive weapons. Three of these deer got out of the area, but the others are doing well. The sex ratio of this release left something to be desired as it consisted of 17 bucks and 7 doe.

BEAVER TRAPPING

Considerable beaver trapping is done, but only when necessary. In most cases the dams are blown out and the lodges destroyed.

Idlewild Experiment Station

LOUIS A. PELLERIN
Area Supervisor

JUNGLE FOWL

The jungle fowl release on the area, as a part of the State Exotic Bird program, is doing reasonably well. District personnel spent considerable time assisting a graduate student and Research Project personnel in gathering information on survival, dispersal, reproduction, and habitat preferences of these birds.

TURKEY TRAPPING

Turkey trapping on the area was not very successful, as it produced only 2 birds for transfer. Cannon nets will be used in the future, rather than the wire traps of the past four years; it is believed that these will be more effective.



Project Leader Robert Murry crating junglefowl for delivery to a conditioning pen on a release area.

Waddill Tract

LOUIS A. PELLERIN
Area Supervisor

Very little work has been done on this area during this biennium due to its being transferred to the Louisiana Department of Parks and Recreation, and then back to the Louisiana Wild Life and Fisheries Commission.

An open shed with tables and benches was constructed for use of picnickers in case of bad weather; this shed has an enclosed (screened) portion with sink and shelf space for preparation of food.

Some clearing, by dozer, was done to establish picnic and camping areas. Also, a firing range is being established. The four ponds dug on the area when the Wild Life and Fisheries Commission first obtained it are stocked and producing some bass and perch fishing for the public at present.

An enclosure was constructed for the purpose of penning 2, or 3 deer just for aesthetic purposes.

Power lines have been run to the area to supply electricity, and rest rooms are being constructed.

A water well is to be dug, and a water system installed. Also nature trails will be established for use by scout groups, church groups and elementary school groups.

St. Helena Parish Research Area

LLOYD C. CUTRER
Area Supervisor

This property consists of 320 acres of hills and drains, privately owned, but turned over to the Commission for use as a jungle fowl release site and for turkey trapping. The jungle fowl releases are "taking" here, too, apparently. More detail will be given elsewhere in this report, by

the research study leader and project leader as to the exact status of the exotic bird projects on this area as well as on Idlewild Experiment Station.

The turkey trapping on this area has met with about the same success (or lack of success) as on Idlewild. Here, again, the cannon nets are being put into use. Two turkeys were taken this year by the old wire traps, and three by the cannon net on its first use.

BOAT RAMPS

Four boat launch ramps are being established in District VII through efforts of the district personnel, and by use of matching federal funds made available by the accelerated Public Works Program.

Chene Blanc Ramp

By means of a short canal which was dug in conjunction with this ramp, boat access may be gained to a large string of waterways, including Bayou Chene Blanc, the Amite River, Blind River, Tickfaw River, Lake Maurepas, etc. Its location is in north Livingston Parish, on La. Hwy. 22 near the Head of Island community. Property for the ramp and parking area are under a 25 year lease to the Commission. Work was completed during summer of 1965.

Bogue Chitto Ramp

Located approximately 1 mile south of the town of Franklinton, on the Bogue Chitto River, this ramp gives access to the Bogue Chitto River, and when the water is high enough, access may be gained to the Pearl River. The property for the ramp and parking area is owned by the town of Franklinton, and is leased to the Commission for 25 years. Construction on this one should be nearing completion at the time of this writing, December, 1965.

Pearl River Ramp #1, Angie

This one is located on the Pearl River, due east of the town of Angie, which is approximately 16 miles north of Bogalusa. Work on this should be nearing completion, but considerable delay has been encountered. An extension to the term on the contract has been requested so there is no way of knowing just when this will be completed. Property for this installation belongs to the Louisiana Wild Life and Fisheries Commission.

Pearl River Ramp #2, Bogalusa

La. Hwy. 10 crosses the Pearl River just east of the corporate limits of the town of Bogalusa, giving access to the launch site, which is just a few yards south of La. Hwy. 10. This is also owned by the Commission. Construction should be nearing completion.

DISTRICT VIII

R. A. BETER
District Supervisor

District VIII is quite unique in that it is comprised almost entirely of marshlands and swamps. It is the largest District in the state, by virtue of its 13 parishes, namely, Orleans, St. Bernard, Plaquemines, Jefferson, Lafourche, St. John the Baptist, Terrebonne, St. James, St. Charles,



R. A. BETER
District Supervisor

Assumption, Iberia, St. Mary and part of St. Martin. The District office is located in New Orleans in the Old Civil Courts Building.

The diversity of game habitats is quite pronounced. The brackish to saline marshes of the southeast portion of the district are inhabited by many ducks and geese during the winter months, as are the other marshes along the southern portion. Fresh water environments along the Mississippi River and Atchafalaya Floodway give rise to ecological conditions which are conducive to waterfowl, deer, rabbits, squirrels, furbearers, and fishes.

In the flat marshlands in the southern portion of the state there is located the tree canopies of the vast fresh water swamps. Intergradation of one habitat with another is a gradual process as one passes from the saline, brackish, and then fresh water from the south to the north.

The hastening of the natural process has been accelerated by man's exploration of the land for minerals. The introduction of salt water into the marshes by access canals and seaways, elimination of fresh water outlets to the estuarine areas, drainage of fresh water swamps, all have had adverse effects on game animals and fishes. Further, the reduction of habitats has resulted from reclamation of forests for agricultural crops, highways, and housing projects.

Public Shooting Grounds

District VIII activities during this biennium

were comprised of development operations on two marshland public shooting grounds and the development of a public hunting area on the Bonnet Carre Floodway. A total of approximately 70,000 acres are in the process of intensive development under the auspices of the Pittman-Robertson Section, Fish and Game Division. The Biloxi Marshlands Public Shooting Ground, comprising 40,000 acres, is the largest of the two areas. Although the 30,000 acre Wisner Public Shooting Ground is somewhat smaller in acreage, it also offers splendid development opportunities.

Considering the extreme diversity of location, vegetation and development aspects, these areas shall be treated as separate entities.

BONNET CARRE PUBLIC SHOOTING GROUNDS

LOUIS V. RICHARDSON
District Biologist

The Bonnet Carre Public Shooting Grounds is located on the U. S. Army Corps of Engineers' Bonnet Carre floodway in St. Charles Parish. The Corps of Engineers leased the area to the Louisiana Wild Life and Fisheries Commission to manage the Fish and Wildlife resources on the area.

More specific location of the area is between Norco and LaPlace on U. S. 61. Bounded specifically by the borrow pits east and west and Highway 61 and Lake Pontchartrain north and south. The area covers approximately 3,800 acres.

The section was designed in the late twenties as a floodway to divert flood waters of the Mississippi River into the Gulf of Mexico via the spillway, into Lake Pontchartrain and finally into the Gulf. The spillway locks have been opened twice since their completion, once in 1937 and again in 1948.

The east and west sides of the area, approximately 1,600 acres, are covered with trees. Domi-

nant species are bald cypress and tupelo gum, with interspersed ash, hackberry, willow, maple, and oaks. The center portion of the area, approximately 2,200 acres, abounds in many types of grasses and aquatic and semi-aquatic plants favorable to wildlife.

A diversity of game, both resident and migratory, can be found on the area during the year. Squirrels are located in the woody areas on both the east and west boundaries. Rabbits are scattered throughout the entire floodway. Scattered numbers of quail are to be found, but are not abundant. Transients, such as doves, woodcock, ducks, coot, snipe, and rails are found in varying numbers during the winter months. Any deer which might be found on the area are considered transient as no deer population of any note is to be found.

Fishing for bass, sunfish, crabs, and crawfish in the pits and sloughs of the area is already a great attraction to many people.

Another opportunity for outdoor recreation sought by many, is blackberry and dewberry picking in the spring and summer months.

The area is criss-crossed by dirt roads which make practically any part of the grounds accessible in dry weather. At present, approximately ten miles of boundary have been painted and marked with signs. A four-strand barbed-wire cattleproof fence has been installed and there are two entrances with cattleguards along the southern (highway) boundary.

Future plans and specifications are now being formulated to develop the area into a very good wildlife area and to provide the maximum amount of usage by the general public.

The area lends itself very much to management for wildlife. One of the primary management tools being considered at present is water control. With water control the area will be more



Earthen closure—Prevents complete draining of ponds.

attractive to waterfowl and by manipulation of water levels greater amounts of crawfish and fish can be harvested.

Through intensive habitat manipulation, Bonnet Carre should take its place among the outstanding management areas in Louisiana.

WISNER PUBLIC SHOOTING GROUNDS

Project W-33-D

This public shooting ground has been active since May 11, 1958. The 30,000 acre tract of potentially good waterfowl land is leased from the Edward Wisner Foundation for a period of 10 years with a 5 year option to renew. It is located in the southeast portion of Lafourche Parish between Leeville and Grand Isle, Louisiana.

Boundaries start at the Southeast Louisiana Canal on the north, Gulf of Mexico on the south, Caminada Bay on the east and Bayou Lafourche on the west.

Actual physical development began on this marshlands during 1959. During the interim, period, a total of 16 wooden structures has been erected on the area. These 16 structures stabilize levels in approximately 12,000 acres of marshland. Water depths in bayous in which wooden structures are placed range from 5 to 8 feet.

Due to the characteristics of the marsh with the interlacing labyrinth of connecting bayous, ditches and lagoons it becomes necessary to construct numerous earthen levees in conjunction with the wooden weirs. The smaller ditches and deteriorated spoil banks along bayous are therefore closed by earthen fills.

All construction work was done with the normal complement of boat captain, dragline operator and dragline operator helper. Three temporary laborers round out a typical dam building crew.

The best procedure was to prefabricate, into triple sections, the vertical sheeting of 2" x 8" x 14' and then load this and the pole pilings necessary to complete one structure onto the dragline barge. All materials were handled by the dragline. While the dragline was being towed to the dam site the laborers were taken by outboard boat to location to begin clearing brush and other obstacles and to stake the exact location of the dam, under the direction of the District Supervisor. Upon arrival of the dragline, all materials were taken from the barge and deposited in equal amounts on both sides of the bayou. Pilings were then driven for this particular structure. After this phase of the operation the installation of horizontal upper and lower walers was completed. The third step of the operation requires a falling tide for completion. The driving of the vertical sheeting can only be accomplished when water is falling from the inside toward the outside of the structure.

The falling tide holds the sheeting flush against

the back side of the horizontal walers. Conversely, if the tide is rising the vertical sheeting is pushed away from the walers and cannot be driven straight and tight. This one condition governs the length of time needed to complete a structure. If tides rise all day and fall at night, then it becomes necessary to shift operations to another locale. By moving to another location it is possible to drive pole pilings and install horizontal walers. Then when tidal conditions have improved the barge returns to the original site. By starting construction in the center of a bayou and completing work toward one bank and then shifting from center toward the opposite banks, the operation can then proceed without interruptions, as tidal movements do not now present a problem. The lateral extension into the bank can now proceed swiftly.

Water depth in excess of 16 inches over the pre-set height of the structure does not present a hindrance to installation if water clarity is prevalent and tides are at ebb flow.

After completion of the structure a 3½ foot protuberance of 2" x 8" lumber is attached perpendicular 10" below the top of the dam from bank to bank to serve as an "apron" or splash rail. Such a device prevents the outfall of water from washing a hole or undermining the outside of the structure. As the water on the inside always remains at a fixed minimum, no attachments such as this is needed there.

When the dam is thus completed the dragline is used to back fill and levee the laterals. The laborers are sent back to camp to complete the building of enough materials for completion of another structure. Then the operation is repeated.

In certain portions of the area it has become a necessity to reconstruct the deteriorated spoil levees created by oil and gas companies in their past exploration and development practices.

Without constant vigilance, restoration and maintenance, the function of wooden structures would be defeated by allowing loss of waters by marsh buggies and seismographic operations.

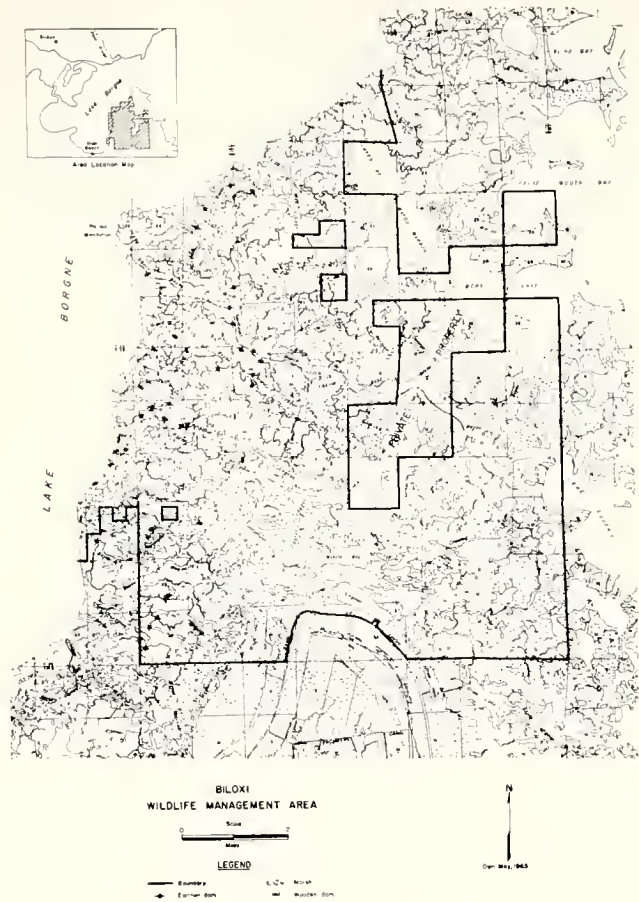
Vegetative types on the Wisner tract consist almost exclusively of the climax species of oyster grass. Controlled burning in some instances will revert this climax back to the sub-climax of leafy three-square and Olney three-quarter. Submerged aquatics consist of widgeon grass almost exclusively.

Each year a new segment of the marsh is selected for development through the use of aerial photographs. After determination of the acreage to be developed by use of aerial photos, an on-site inspection is used to determine depths and widths of bayous, ditches, and lagoons to be closed. Then soil borings are made across these same openings to ascertain suitable soil type and texture and also whether or not shells or old stumps would hinder the installation of wooden pilings. If such conditions are encountered then

a new location is plotted and procedures repeated. After field inspections are complete and deemed satisfactory, then tabulation of materials, cost, and personnel needed are computed and documented for final approval. Detailed work plans are also submitted with respect to approximate man days needed, construction, and procedures to be followed.

All developments are scheduled to be done on the Wisner tract during the winter and spring months. This is necessary due to the area being conducive to inside movements of dragline and barge without having to go into open water of large lakes during winter "Northerners" such as it is necessary on Biloxi Public Shooting Grounds. Such a condition permits the working in six month segments on each area and during conducive weather conditions on both.

Three shelled boat launching areas were installed and maintained adjacent to the area by the Lafourche Parish Police Jury. The first site is located on the west side of Hwy. 1, near Bayou Moreau, about seven miles south of Leeville. The second launching area is located on the south side of the same highway at Dos Gris, Louisiana, about 15 miles south of Leeville. The third public launching area is located on the north side of Hwy. 1, adjacent to Bayou Fer Blanc. In addition to these three sites an additional parking and launching site has been offered by the Department of Highways on the new highway to Pass Foucher.



Biloxi WMA

BILOXI MASHLANDS PUBLIC SHOOTING
GROUNDS

Project W-33-D

This area comprising 40,000 acres of good waterfowl area along coastal Louisiana, was acquired October 1, 1958. It is located approximately 30 miles southeast of New Orleans in St. Bernard Parish.



Small drainage ditch which has been closed to prevent water loss.

This public shooting ground is accessible from almost any direction. Access points are as close as Shell Beach, Ysckloskey and Hopedale. Larger boats take the more direct route south across Lake Borgne from Chef Menteur and Rigolets.

The interior marsh is a labyrinth of bayous, lagoons, ditches and ponds. Nearly every pond and lagoon has an abundance of aquatics, such as widgeon grass, southern naiid, and coontail.



Unloading vertical sheeting for structures in Biloxi Marsh lands.



Installation of vertical sheeting at high tide.

Diving ducks (scaup) and puddle ducks (mallards, teal, gadwalls, and baldpate) come into the myriad of ponds to feed upon the new shoots of three-cornered grass following burning procedures.

Isolated ridges which now lie dormant stand as mute testimony of the old distributary of the Mississippi River, Bayou Loutre. Upon these ridges rabbit, deer and the ever present cottonmouth occur.

Salt water fishes such as speckled trout, redfish, sheephead, etc. are abundant in the waters of this area as are freshwater fishes such as redear and bluegill sunfish and some black bass. The area is heavily utilized by sport fishermen throughout the year. Particular emphasis is now placed on fishing around the recently completed structures. Success has been phenomenal on all species of salt water fish that occur locally.

Actual physical development commenced in January of 1960. A total of 18 wooden structures



Installation of apron on wood structure at Biloxi.

were installed during the prior biennium. In addition two small manually installed structures were erected. These installations now make water level controls possible on 5,500 acres.

Earthen fills coupled with wooden structures will tend to stabilize water levels throughout the whole of the developed area. Stabilized water levels should insure the annual production of submerged aquatics such as widgeon grass. Also, stabilized water levels will provide better access during winter months when northwest winds usually blow practically all the water from ponds and lagoons.

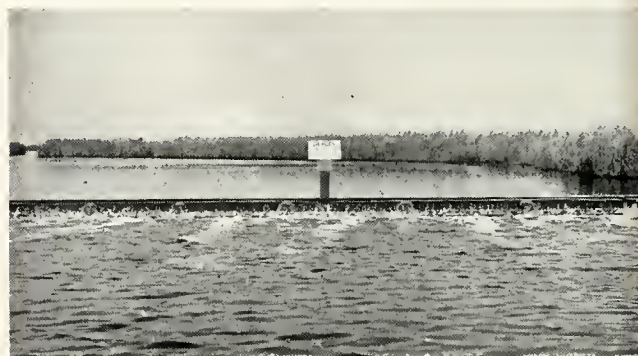
Hurricanes off the Louisiana coast during 1964 and 1965 resulted only in delays of operations as it was necessary to move personnel and equipment to safe harbors for the duration of the hurricane warning. No physical damage was incurred on either the Biloxi or Wisner area during these storms.

Controlled burning of the marsh will reduce the climax vegetation of wire grass, big cord grass and oyster grass. Growths of sub-climax vegetation of three-cornered grass and leafy three-square, which are favored by geese and muskrats, should result.

The waterfowl seasons saw development operations well under way and more hunters and fishermen taking advantage of the hunting and fishing opportunities with undeniable proof of successes.



Hand structure—Approximately 13 feet across. Low tide.



Wooden structure—Low tide

No restrictive measures such as daily permits, number of hunters, etc., are required as prerequisites to hunting or fishing on either the Biloxi or Wisner Public Shooting Grounds.

PROPOSED BOHEMIA SPILLWAY PUBLIC SHOOTING GROUNDS

A biological reconnaissance has been conducted and recommendations and suggestions submitted regarding this potential public shooting ground. A total of approximately 33,000 acres, located in Plaquemines Parish on the east side of the Mississippi River between Bohemia and Ostrica, are involved. The Louisiana Wild Life and Fisheries Commission has taken under advisement this offer from the Orleans Levee Board.

Potential for deer, rabbit and rail hunting is excellent on portions of this area. Diving ducks in the large bays and lagoons and dabbling ducks in the interior marsh would provide a boon to hunters.

Future Trends

Recommendations for future trends in District VIII encompass the selecting of release sites for wild turkey, exotic birds, and acquisition of more game management areas.

Recognizing the fact that the wild turkey is native to the United States and is completely absent or extremely scarce in District VIII, a detailed biological reconnaissance of suitable sites was made to ascertain what remedial steps could be taken to alleviate this situation. If adequate numbers of turkeys are acquired from other districts, then a release or release site will be made in District VIII.

Various species of exotic game birds shall in all probability be released in various sections of the district in the foreseeable future.

All releases and perpetuation of native species of game are contingent upon habitat. Proper biological approaches and acquisition by ownership of habitats will determine the future trends of all game and the providing of areas to hunt by all future sportsmen.

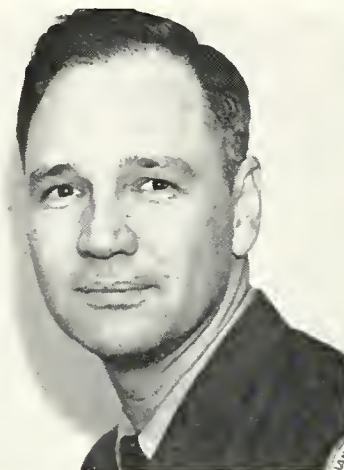
WILDLIFE AND HURRICANE BETSY

Although Hurricane Betsy drove with full fury through the marshlands of Southeast Louisiana and caused a great amount of damage it did not permanently affect the wildlife of the area to any considerable degree. Commission technicians surveying the area found that many animals of all the resident species survived the storm by various means and that the Biloxi Area still held a breeding population of rabbits, deer, raccoon, nutria, squirrel, otters, muskrats, etc. The damage to the habitat is also considered temporary and the vegetation is already starting to make its comeback. The effects of the storm need not be considered in setting future hunting seasons.

Forest Game Management

JOHN L. HAYGOOD
Biologist

The forest produces more than half of Louisiana's wild game. Practically all of the deer, turkey, squirrels and wood ducks are produced in the forest. A big share of the remaining game birds and animals (rabbits, quail, dove, woodcock) are also produced in the forest. That all boils down to the fact that we are dependent on forest for most of our hunting. Present land trends are making this more true every day. Agriculture is moving to bigger farms, cleaner farming and more powerful insecticides. These farm changes along with an increase in cattle production tend to push farm game right off the farm.



JOHN L. HAYGOOD
Biologist

Of course, this is just one of the prices of progress which cannot and should not be set back. It further points out the importance of our forest game. This picture is not dark; indeed, far from it. Our upland forests are increasing: Louisiana now has 16,038,000 acres in forest. Every forest acre has potential as a wildlife producer. What that potential is and how it can be achieved is explained as follows.

At the present time deer offer the greatest potential for increased game production. Most of Louisiana's forest types are good deer range; some better than others. These forests will support at least one deer to 60 acres, for a potential annual carrying capacity of 267,300 deer. Good deer management practices dictate harvesting $\frac{1}{3}$ rd of the total herd each year, which means with proper conservation and management practices Louisiana can support 267,300 deer and have a yearly kill of 89,100. This is indeed a goal for Louisiana sportsmen to shoot for.

Wild turkey in huntable numbers at the present time are restricted to three areas of the state, the

Florida parishes, Madison and Tensas parishes, Morehouse and Union parishes. With good conservation and management practices huntable populations of wild turkey could be established over much of the forested area of Louisiana.

The two above mentioned examples, deer and turkey, show what can be done for forest game at the present time. To reach these goals present forest use would not have to be changed. The landowner would not have to spend or lose one cent. This could and should be a side benefit of the forest, produced without sacrificing any other value.

What can sportsmen do to reach these goals and why hasn't it already been done? The last question first, why hasn't more been done to reach the above goals. The public does not know enough about conservation and management of wildlife to see the benefits that can be afforded by it. This lack of knowledge and foresight on the part of the public greatly hampers and discourages constructive actions by the proper state agencies. It usually takes several years to see the benefits of conservation programs. Quite often public support wanes before a program is complete and thereby lessens its benefits.

On the other hand if sportsmen will demand and support long range wildlife conservation and management programs great benefits can be reached. At the present time two conditions exist in Louisiana; (1) In most cases there is an under stocking of deer because the herd has not been allowed to build up. (2) On other areas, overstocking, where deer herds were allowed to exceed range carrying capacity, public sentiment has prevented proper harvest and control resulting in range depletion, crop damage and seedling damage. Neither is good conservation; both need long range management carried out along proper conservation lines.

This situation isn't unique in Louisiana, the same is true for the entire south. Conservation and management of wildlife resources is fairly new. Forest game habitat has undergone vast changes in the last 50 years. The potential is there, it is up to the sportsmen as how it will be used.

TEN YEARS CONTROLLED HUNTING ON LOUISIANA'S WILDLIFE MANAGEMENT AREAS

Introduction

The Fish and Game Division of the Louisiana Wild Life and Fisheries Commission manages the wildlife on 739,491 acres for public hunting. This acreage is in 28 different hunting areas varying in size from 1,200 to 105,000 acres. The topography varies from the pine-hardwood hills, to Mississippi delta hardwood bottom lands, to

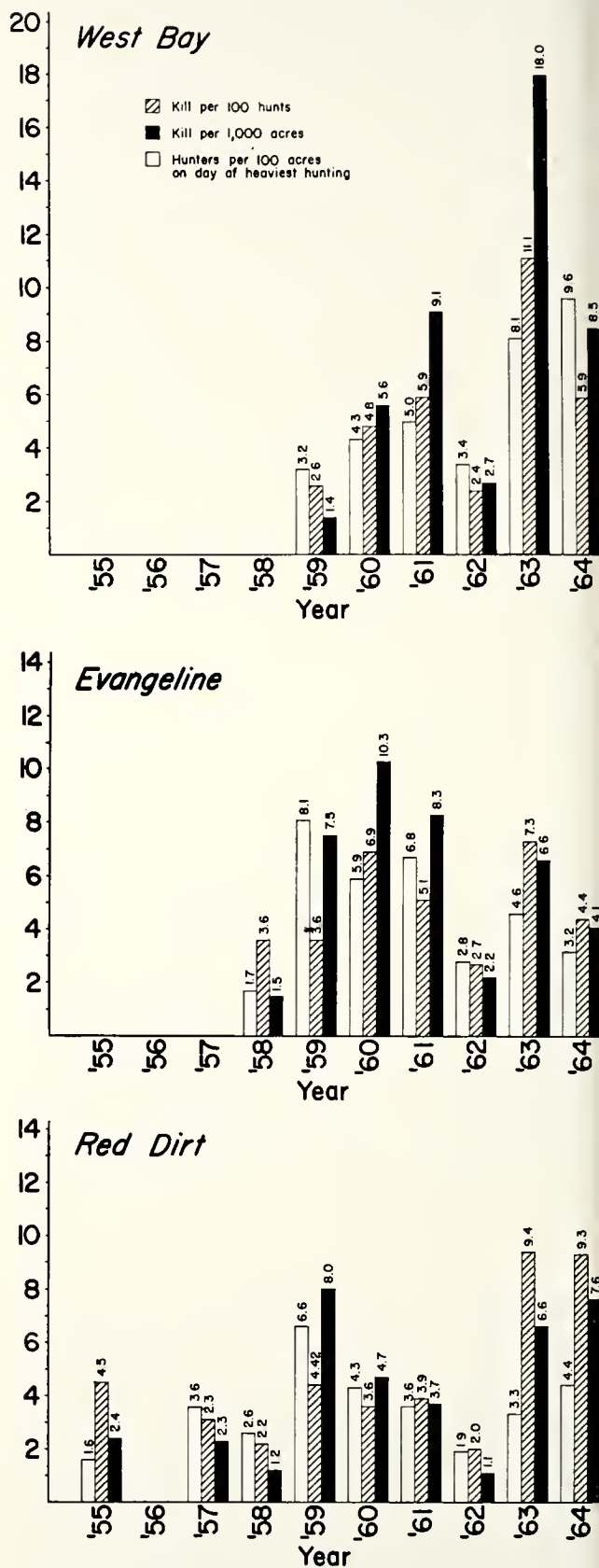


Figure 1

(Deer Harvest)

coastal marsh near the Gulf of Mexico. Every vegetative type of Louisiana is represented on some of the Management Areas except the southwest prairies and the coastal cypress swamp.

Whitetail deer is the major game animal, with squirrel, water fowl, quail, mourning doves, rabbits, and turkeys, in order of importance. The oldest management areas were set up in the late forties primarily for deer. All hunting was prohibited to aid in a speedy build up of the deer herd. This was the beginning and the backbone of Louisiana's deer herd rehabilitation program. From the beginning the objective was to establish, through restocking, a deer herd, build it up to huntable numbers, manage and control these herds through public hunting. The general public from the beginning thought of these areas as refuges where deer herds would build up and overflow on the surrounding area like an artesian well. Areas established later were never closed to small game hunting during the regular season and if there were sufficient deer on the area for stocking, the deer season was never closed. Louisiana law wisely prohibits the use of dogs to hunt deer on Management Areas. In

fact the law prohibits the use of dogs for hunting any game quadruped. Unfortunately, this also prevents the use of dogs to hunt squirrels or rabbits. But at the present time there is little demand for a place to hunt squirrels and rabbits with dogs, so the loss is insignificant.

Louisiana regulates or permits public hunting on these Management Areas under three different systems.

- (1) Hunting allowed by daily permit only, the hunters are required to check in and out at a check station daily.
- (2) Hunting allowed by season permit, this permit is obtained at the District Offices and is valid for the entire specified season.
- (3) No permit of any kind is required.

All permits are free, there is no charge for hunting on any Louisiana Management Area. The number of hunters per day or per season is not restricted with the exception of Zemurray Park Area.

Land ownership of wildlife areas is varied. The Wild Life and Fisheries Commission owns the land on two Management Areas totaling 75,000 acres; other landowners are the U. S. Forest Service,

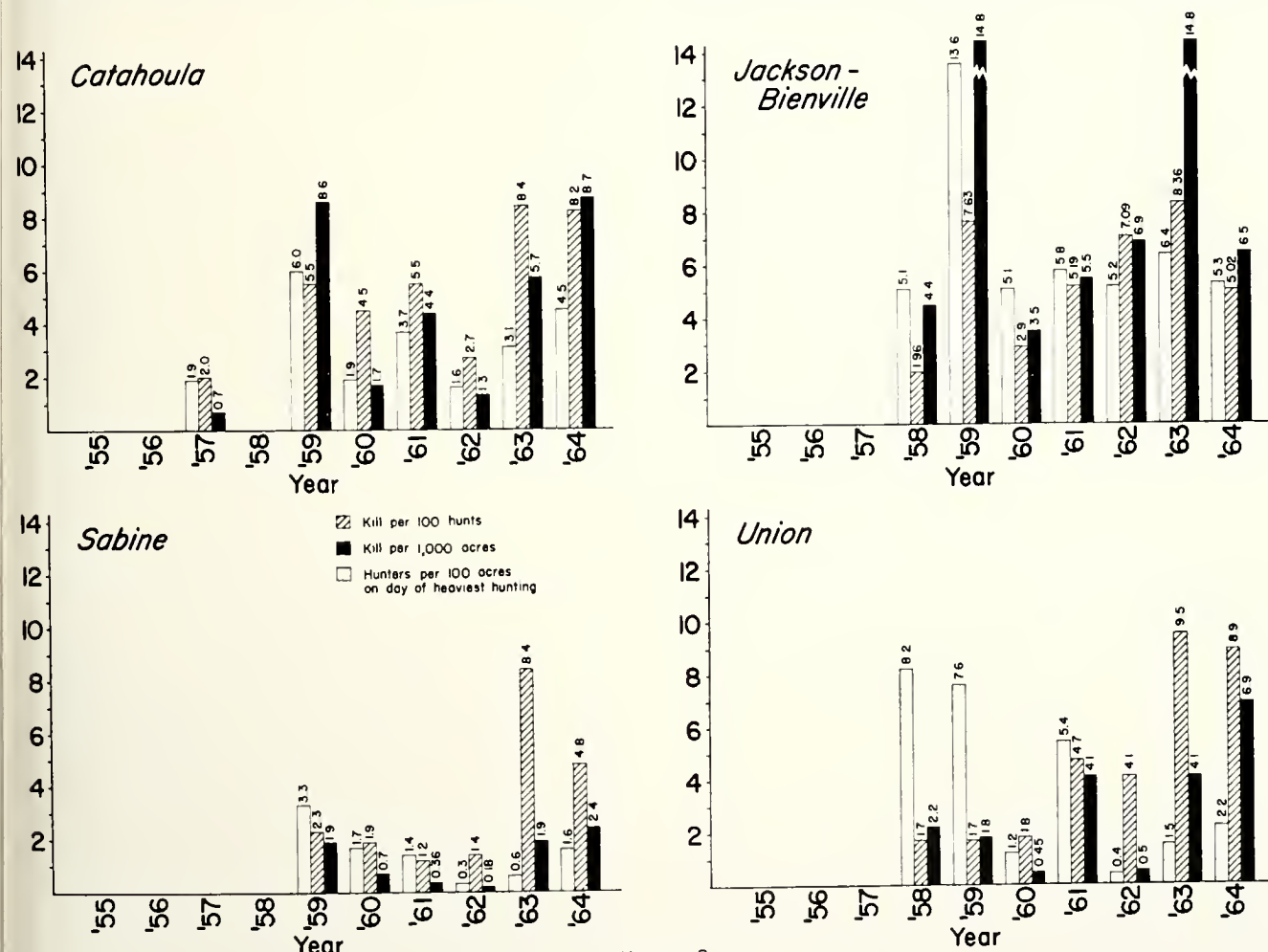


Figure 2
(Deer Harvest)

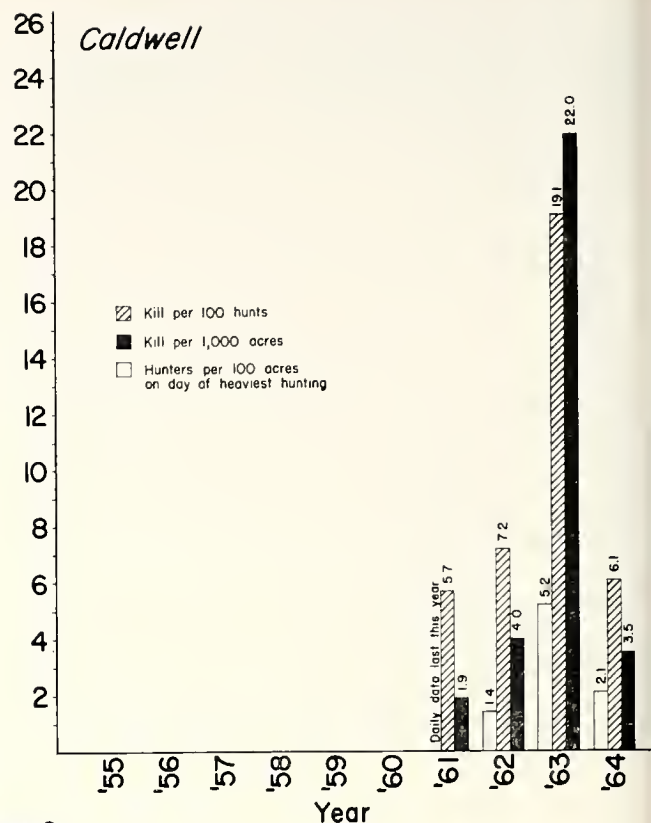
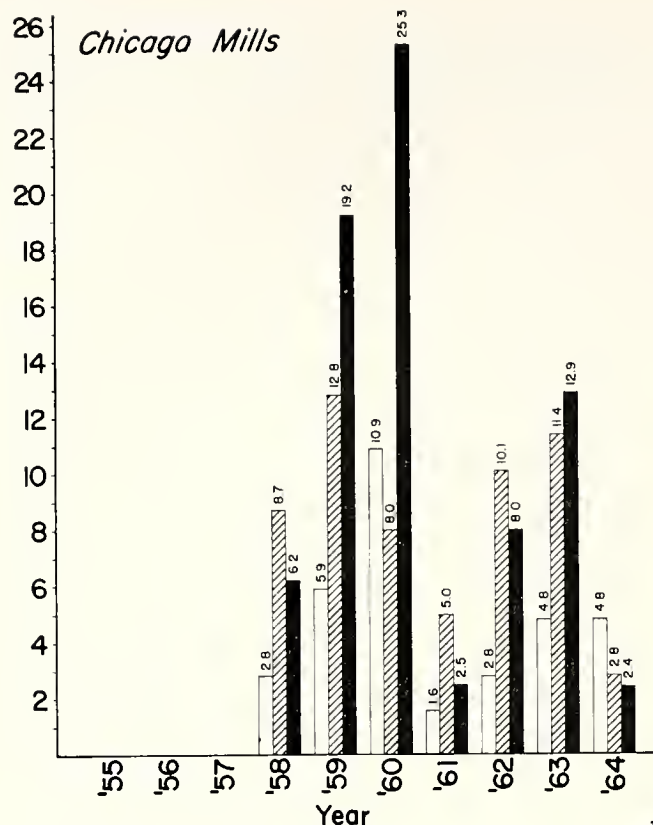


Figure 3
(Deer Harvest)

U. S. Corps of Engineers, Timber Companies, and private individuals. With the exception of a coastal marsh area where the state pays the annual land taxes, the Wildlife and Fisheries leases the wildlife rights at no cost or fee.

Managed Hunts

This paper will include only the areas where daily permits are required and data on deer hunting only. Management Areas where season permits or no permit is required have no back log of hunter data.

At the present time there are 15 areas totaling 431,740 acres that require daily hunting permits, 7 areas totaling 204,676 acres requiring season permits and 6 areas totaling 103,075 acres that require no permit. Of the 15 areas requiring daily permits there are 9 which have a sufficient back log of hunter data for analysis. The following is a brief description of the nine areas.

Red Dirt

Red Dirt Game Management Area is on Kisatchie National Forest (Kisatchie Division). It contains 38,000 acres in Natchitoches Parish. The topography is steep rolling hills with a few rocky out crops. The timber is longleaf pine with the associated hardwoods. This area is under intense commercial pine production with cattle grazing on 8,000 acres. Red Dirt was an old

Forest Service Refuge converted to a Management Area in the late forties. The Area opened to deer hunting for the first time in 1955. At this time range studies indicated the deer herd was at or above long range carrying capacity. A five day, or 100 deer, whichever come first, bucks only hunting season was carried out with 1966 efforts harvesting 90 bucks. Table No. 1. A legal buck in Louisiana is a deer having 3 inch antlers, except in 1958 when only visible antlers were required. The storm of public opinion opposed to opening the "refuge" prevented the Commission from opening the season in 1956.

A five day bucks only season with a 100 buck limit was set and carried out on Red Dirt in 1957 and 1958. The first either sex hunt was carried out in 1959. That year the managed hunt was in two sections of three days each with either sex deer legal on the last day of the last hunt. As Table 1 will indicate the 1959 season provided the greatest participation and the largest kill for any one year. There were three opening days that year, a two way split hunting season and an either sex deer hunt on the last day of the last season. It will be shown later that the opening day provides the greater portion of hunter use. The 1960 and 1961 hunts were for five days with the first four for bucks only and the last day for either sex. The either sex hunt was cut in 1962 and with this hunter participation went down. Either sex hunting was started on the first day of the 1963 season. A 150 deer limit was set,

when this number was reached the hunt would convert to bucks only for a total of five days hunting. The first day 234 deer were killed, of which, 121 were does. The limit of 250 deer was set for the 1964 season and either sex hunting killed this number in two days. The hunt went on for three more days for bucks only.

Table I
RED DIRT

Year	No. Days	No. Hunters	Deer Kill
1955	5	1,996	90
1957	5	2,765	86
1958	5	2,090	47
1959	6	7,616	337*
1960	5	4,898	177*
1961	5	3,545	140*
1962	6	2,059	42
1963	5	2,650	250*
1964	5	3,121	290**

*One day either sex.
**Two days either sex.

Catahoula Game Management Area

Catahoula Game Management Area is another old Forest Service Refuge converted to a Management Area at the same time as Red Dirt. It is on the Catahoula Division of Kisatchie National Forest located in Winn and Grant Parishes and contains 40,000 acres. The topography is gentle rolling hills with some flatwoods areas. Timber is of the loblolly-shortleaf pine hardwood type. Free ranging cattle and hogs graze the entire area with the exception of a 3,000 acre fenced area where they are excluded. Range surveys in the early fifties indicated over browsing of the preferred deer food plants. The deer season (bucks only) was opened for the first time in 1957, Table 2, once again public opposition to opening the refuge caused the Commission to close the deer season in 1958.

The 1959 hunt was the same as Red Dirt, six days split into two periods with either sex deer legal on the last day of the last hunt. Here again this type season provided the greater number of hunter days and deer kill. Another thing that accounted for this large hunter participation in 1959 was the fact that opening day on the Management Areas around the state was staggered. Red Dirt and Catahoula opened on November 14 and 21; Jackson-Bienville and Union opened on November 28; Chicago Mills opened on December 1. This method of split seasons and staggered opening dates made a bonanza for hunters and provided a good harvest of deer; but it raised a storm of local opposition, local people complained of the outsiders overcrowding "their" areas and killing "their" deer. As you can see by the records that was the only year we were brave enough to try this type of hunting season. Public opinion prevented an either sex season in 1960. The 1961 season again contained one day of either sex hunting, but 1962 went back to bucks only again. Hunting success picked up in 1963 when

the season was changed back to a one day either sex hunt. 1964 had a five day either sex hunt, with excellent success.

Table 2
CATAHOULA

Year	No. Days	No. Hunters	Deer Kill
1957	5	1,301	26
1959	6	6,390	355*
1960	3	1,541	69
1961	5	3,218	177*
1962	6	1,927	53
1963	5	2,688	226*
1964	5	4,206	347**

*One day either sex.
**Five days either sex.

Evangeline

The Evangeline Area contains 15,000 acres of the Evangeline Division of Kisatchie National Forest in Rapides Parish. This area is the long-leaf pine type with moderate rolling hills. Cattle grazing has been heavy, browse surveys indicate over browsing of preferred deer foods. From outward appearances this area is very poor deer range, but it has been a very good deer producer. Hunting started in 1958 and has continued annually up to the present time, Table 3.

The 1958 managed hunt was for three days, bucks only. Either sex hunting started in 1959 with the last day of the hunt for either sex; this continued until 1962 when the either sex season was closed again. Evangeline has an open understory with overstory of long leaf pine; heavy grazing by cattle have kept the grasses short. Visibility is very good, because of this. It was thought that more than one day of either sex hunting would over harvest the deer. In 1963 the either sex hunting began on opening day. To prevent over harvest a 75 deer limit was set for the either sex hunt. This number was attained the first day and the remaining four days went to bucks only. The next year, 1964, the either sex limit was upped to 125 deer and the either sex hunt ran the full five days with 62 deer harvested. Alexander State Forest, an old refuge, located near Evangeline opened for the first time in 1964; this attracted hunters away from Evangeline and reduced the total number of hunters and kill. The results of the 1964 hunt indicate five days either sex hunting with moderate hunting pressure will not over harvest deer.

Table 3
EVANGELINE

Year	No. Days	No. Hunters	Deer Kill
1958	3	606	22
1959	3	3,132	113*
1960	5	2,226	154*
1961	5	2,425	125*
1962	6	1,218	33
1963	5	1,314	99*
1964	5	1,420	63**

*One Day either sex.
**Five days either sex.

Sabine Game Management Area

The Sabine Area contains 11,000 acres located in Sabine Parish, west central Louisiana. The land within the boundaries is in private ownership. Topography is gentle rolling hills, timbered with a continuous loblolly-shortleaf pine hardwood forest. Free ranging cattle graze the entire area year around. Deer range surveys indicated a fully stocked range, and the season was opened in 1959. Every year except 1962 has had at least one day of either sex deer hunting. Hunter participation and total harvest have been notoriously low, Table 4. Probably Sabine's location accounts for this low use. Hunters from the urban areas of Louisiana have to pass through good deer hunting country to get to Sabine. Yet with a low total harvest the kill per 100 hunters, for the last two years, is about average for the state.

Table 4

SABINE

Year	No. Days	No. Hunters	Deer Kill
1959	3	898	21*
1960	5	409	8*
1961	5	319	4*
1962	6	140	2
1963	5	251	21**
1964	5	540	26**

*One Day either sex.
**Five days either sex.

Jackson-Bienville Game Management Area

Jackson-Bienville Game Management Area contains 22,000 acres in the corner of Jackson and Bienville Parishes. The topography is gentle rolling hills with loblolly-shortleaf pine and hardwood type trees. Land ownership is in private lumber companies who lease the wildlife rights to the state. There is no competition with livestock here for parish regulations prohibit free ranging livestock. Operation of this area was started in the early fifties and deer were stocked at this time. By 1958 range surveys indicated a fully stocked area, and hunting was begun that fall and has continued annually up to the present time, Table 5.

The 1958 managed hunt was for bucks only, hunting was split into two segments with five days the first part and seven the last. Either sex deer hunting was permitted the next year, 1959, with a 350 deer limit. There were 325 deer killed the first two days and hunting was closed for the year. The first day of this hunt had the highest hunter density per 100 acres ever recorded for the state, 13.6 hunters per 100 acres.

Jackson-Bienville's undergrowth is very dense, it seems this area requires high hunter density to harvest deer. Either sex deer hunts have continued annually after the opening year. Local public pressure has not been a problem in the management of this area.

Table 5
JACKSON-BIENVILLE

Year	No. Days	No. Hunters	Deer Kill
1958	12	4,938	97
1959	2	4,257	325**
1960	5	2,616	76*
1961	5	2,350	122*
1962	6	2,142	152*
1963	5	3,883	325***
1964	5	2,847	143***

*One day either sex.
**Two days either sex.
***Five days either sex.

Table 6
UNION

Year	No. Days	No. Hunters	Deer Kill
1958	3	1,410	24
1959	3	1,194	20
1960	5	272	5
1961	5	961	45*
1962	5	145	6*
1963	5	511	49**
1964	5	856	76**

*One Day either sex.
**Five days either sex.

Caldwell

Caldwell Game Management Area, 11,000 acres in size, was set up at the same time as Sabine, Jackson-Bienville and Union and operated in the same way. The land ownership is in private interest with the state leasing the Wildlife rights. All of this area is in hardwood river bottoms. It lies just above the junction of the Bouef and Ouachita Rivers in Caldwell Parish. During high water years most of the 11,000 acres are flooded for a brief period. Free ranging cattle and hogs have over grazed this area many years.

Study plots put in by the Wildlife and Fisheries indicate the livestock are keeping the under brush in this area open and park-like. A landowner fenced 4,000 acres and excluded cattle in order to grow a new stand of timber. Deer numbers seemed to increase noticeably after the 4,000 acres was fenced. This area was opened for hunting in 1961 for the first time.

The first two years were for bucks only, Table 7; then 1963 had a one day either sex hunt. This one day hunt had the second highest kill per 1,000 acres and the highest success per 100 hunters of any managed hunt in the state. Hunter density was not high, probably a high deer density and open woodland with good visibility accounted for the large kill. As usual the public thought the deer were killed out after the doe hunt and pressure was brought to bear, as a result the 1964 season was for bucks only.

Table 7
CALDWELL

Year	No. Days	No. Hunters	Deer Kill
1961	5	365	21
1962	5	608	44
1963	5	1,268	242*
1964	5	641	39

*One day either sex.

Chicago Mills

Chicago Mills Game Management Area consists of the old Singer and Ayers Refuge (This was the home of the last known ivory bill woodpecker in Louisiana), with 105,000 acres of Mississippi delta hardwoods in Madison Tensas and Franklin Parishes. The land is flat and poorly drained river bottoms, with very little overflow. Deer browse surveys since the early fifties (this was when Louisiana started making deer browse surveys) have indicated over browsing of deer food plants. Hunter access in this area is poor; there is a lack of roads and the woods are impassable for vehicles after the first fall rains.

The first managed deer hunt was held in 1958; Table 8, at that time the area contained only 29,000 acres. This first managed hunt (5 days) was an odd one, antlerless deer only were legal. There has probably been more public animosity toward managed hunting and the lack of it on Chicago-Mills than any other area in the state. It is in the heart of old deer hunting territory; herds were built up here by diligent protection after the 1927 flood. Deer crop damage has been heavy on the adjacent farms. As a result hunts have been erratic, data from this area is hardly comparable to the rest of the state. The 1959 season was a ten day hunt with the first three days for either sex deer. Hunting pressure was building up each year, the five day season of 1960 attracted twice as many hunters as the year before. But 1961 went back to bucks only and hunter participation fell back almost one half while that year the area increased 75,000 acres in size. In 1962



Game management area deer hunts provide recreation for a large number of Louisiana hunters each year.

either sex deer were legal the first two days in only the 29,500 acres that lie in Tensas Parish. The entire area was open in 1963 for either sex deer with a 1,000 deer limit, 1,180 were killed the first day.

The 1964 season was set with a 1,500 either sex deer limit, but the day before opening day opposition to doe hunting closed this area to either sex deer hunting. As you can see from the above information managed deer hunting has been a push and pull affair. The Wildlife and Fisheries Commission has been pushing for good deer management, trying to provide the maximum in hunter recreation and keep the deer within the carrying capacity of its range. Misguided public opinion has been pulling control of the managed hunts from under the Commission.

Table 8

CHICAGO-MILLS

Year	No. Days	No. Hunters	Deer Kill
1958	5	2,105	183 ¹
1959	10	4,410	566 ²
1960	5	9,359	746 ³
1961	5	5,172	260
1962	5	8,357	844 ⁴
1963	5	11,888	1,360 ³
1964	5	9,247	256

¹Five days antlerless deer.

²Three days either sex.

³One day either sex.

⁴Two days either sex.

West Bay

West Bay Wildlife Management Area lies in the gulf coastal plain, longleaf pine type land of Allen Parish. It originally contained 18,500 acres; in 1960 additional acreage was leased bringing the size up to its present 58,000 acres. All lands within West Bay are privately owned. The topography is flat and poorly drained with fingers and bays of gulf coastal plain hardwoods along the drainage pattern. Establishment, operation and history is about the same as the other areas acquired in the late forties and early fifties. Deer herds were overpopulated when the first managed hunt was held in 1959, Table 9. There has been much adverse public sentiment toward opening this "refuge" to any hunting and especially against shooting does. The 1959 and 1962 hunts were for bucks only, with all other years having one day of either sex deer hunting. The original 18,500 acre refuge was closed to all hunting in 1964.

Table 9

WEST BAY

Year	No. Days	No. Hunters	Deer Kill
1959	3	2,760	72
1960	5	5,769	279*
1961	5	7,643	455*
1962	6	5,522	135
1963	5	8,072	900*
1964	5	5,607	335**

*One day either sex.

**One day either sex on 39,500 acres.

Discussion

Before Louisiana set up any special management hunts the Fish and Game Division contacted other states throughout the nation. They were asked how they operated their special hunts, and for advice on how to handle ours. Answers to this inquiry advised against lottery type drawings, allowing any special privileges to influential groups and limiting the hunts to a given number of participants. As the result of this Louisiana went into the managed hunt business with no daily or seasonal limit on the number of hunters and no special privileges to anyone. Later when the 5,000 acre Zemurray Park was opened to hunting a limit of 100 hunters per day was set and participants were picked by a drawing. This limit and drawing has not worked out for the best management or public relations.

Allowing an unlimited number of hunters into an area on any one day has caused some problems, but these problems are mostly imaginary in people's minds. Complaints are based upon overcrowding, fear of getting shot, etc. Once hunters became accustomed to hunting during managed hunts for deer without dogs, they found that a large number of hunters on a given area usually increased hunter success. In fact, during recent hunts, hunters complained of not enough hunters in the woods to make good hunting. It appears hunters are more safety conscious when they know there is a high density of hunters in the area. In all the managed hunts there has been only one hunting fatality. A man in a tree was mistaken for a bobcat and shot. Two men have been shot in the leg and one shot in the arm, three men were struck by spent buckshot. None of these accidents were associated with a particularly high hunter density. Jackson-Bienville recorded the highest hunter density per 100 acres (13.6) for any one day and the only accident for this area was when a man had a pistol go off in his pocket and the bullet grazed his leg.

Table 10

TOTAL RESULTS OF MANAGED DEER HUNTS

Year	Areas Open	Hunting Efforts	Deer Killed	Kill/100 Hunts
1955	1	1,996	90	4.50
1957	2	4,066	112	2.75
1958	5	11,149	373	3.34
1959	8	23,457	1,809	7.71
1960	8	27,088	1,514	5.58
1961	9	25,695	1,330	5.17
1962	10	22,245	1,312	5.89
1963	11	35,909	3,661	10.19
1964	13	38,224	2,129	5.56
TOTAL	.....	189,879	12,330	

Checks made in the field after the hunts indicated that the crippling loss of deer is low. Apparently, during times of high hunter density,

hunters finish off each other's crippled deer. After the first hunt on Red Dirt in 1955, a survey was carried out to determine crippling and illegal kill loss (this was a bucks only hunt). Observers walked compass lines at regular intervals through the area looking for dead deer; two were found. Using this strip census method it was computed that the crippling and illegal kill loss for Red Dirt totaled 13.

In reviewing the kill data on figures No. 1, 2 & 3 the first thing one notices is the erratic aspect of the annual harvest. This lack of consistency in annual hunts robs the management data of much of its value. However, much valuable information can be gleaned from the present data.

After the 1961 either sex season on Red Dirt, West Bay, Evangeline, Catahoula and Union, the local people thought deer on these areas were over shot. The Commission yielded to pressure and set a bucks only season for 1962. Data from the 1962 season demonstrates hunting success was equal to or better for bucks, after the 1961 either sex season, than before. On Union and Catahoula buck hunting was even better than the first year these areas opened. Caldwell is another good example, in 1963 there were 22 deer killed per 1,000 acres or a deer to every 45 acres. The next year with a bucks only season hunters had better hunting than they had the first year this area was opened, (after ten years of closed hunting season). This would indicate either sex hunting is not detrimental to deer herds. The bargraphs are difficult to interpret for the hunting relations changed so from year to year. However, one can readily see hunter success and total harvest are generally improving after several years of hunting. An exception to this is Chicago Mills, with an increase in acreage the use and harvest per acre went down.

Fluctuation of the annual deer harvest on these nine areas is primarily due to hunting regulation changes. When regulations permitted liberal hunting at a time that would attract large numbers of hunters, the kill on any one area was high. The hunter density bar compared to the deer kill bar in figures 1, 2 & 3 illustrates this. It is a known fact that on a fully stocked deer range, deer cannot be stock-piled. This would indicate Louisiana has wasted many deer that could have been harvested by the sportsmen. To get a theoretical estimate of the deer loss through poor management, I used the highest kill per 1,000 acres on each area as a standard, then subtracted the kill for each year from this standard to get a total deer harvest loss for each area. Union and Sabine have had such low hunter participation, Catahoula kill figures were used for these areas. Catahoula is similiar deer range to both these areas. The results of this are in Table 11.

Table 11

**DEER LOSS TO SPORTSMEN THROUGH
RESTRICTIVE REGULATIONS 1955-1964**

Area	Killed	Lost
Jackson-Bienville	1,240	1,035
Red Dirt	1,459	1,474
Catahoula	1,253	1,232
Evangeline	608	471
Sabine	82	506
Union	225	461
Caldwell	346	622
Chicago Mills	4,215	8,026
West Bay	2,177	2,659
TOTAL	11,605	16,486

Table 11 illustrates what could be done in the future to provide more recreation for hunters in the areas now under management. To prevent future harvesting loss of deer, hunting regulations would have to encourage more hunting by manipulating the seasons; an example would be a season made up of several short segments and/or staggered opening days over the state. I do not believe a long continuous hunting season would accomplish this goal in Louisiana.

There has been a great deal of local interest in what would have happened if many of the one day either sex deer hunts had continued for five days. To help answer this I computed the daily average of hunter participation and kill for the five day either sex hunts on Catahoula, Jackson-Bienville, Union, Sabine and Evangeline, Table 12.

Table 12

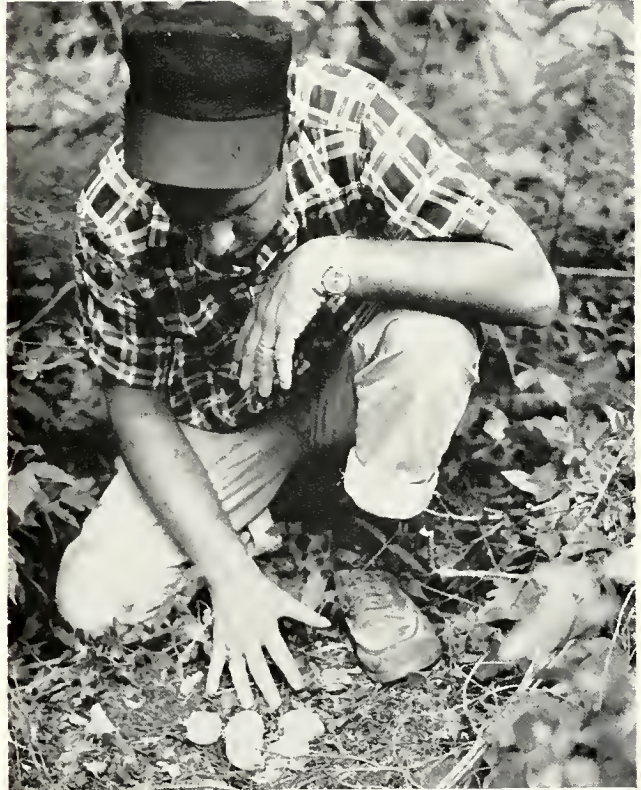
**PER CENT HUNTER PARTICIPATION AND KILL
FOR FIVE DAY EITHER SEX HUNTS**

Day	No. Hunters	% Hunter	Deer Killed	% Deer Kill
1	5,311	37.9	445	44.4
2	4,051	28.9	329	32.8
3	2,538	18.1	143	14.2
4	1,078	7.7	45	4.4
5	1,020	7.2	39	3.8
TOTAL .	13,998		1,001	

As you can see in Table 12 three fourths of the deer were killed on the first two days. The length of season has little to do with total kill. Two thirds of the total hunting efforts were also on the first two days. Hunter participation and deer harvest are tied directly to opening day, not season length. To bring this out more clearly let's look back at the Red Dirt Data. The 1959 hunt was split into two segments with the last day of the last segment for either sex, this either sex day acted as another opening day. That year had nearly twice the hunter efforts of any other year. Catahoula had the same season with the same result. It would appear from this that one way to increase hunting efforts and deer kill is to have several opening days. The 1959 hunts also indicate that staggered opening days of adjacent areas will increase hunter participation.

In 1959 Jackson-Bienville opened at a later date than the adjacent areas, and consequently set a record for numbers of hunting efforts with just a two day season. Chicago Mills data indicates that a long bucks only season provides little additional recreation. The 1959 season ran for 10 days, the first three days for bucks or does, the last seven days for bucks only. These last seven days provided only 16.5 per cent of the total hunting efforts and the last four days only six per cent. This information is important where managed hunts are expensive to operate. The objective of managed hunts is to provide recreation and to adequately harvest the surplus deer. Short split seasons can do a better job at less cost than long continuous seasons.

A lack of public support has been Louisiana's biggest drawback to efficient deer management. The public has not been educated to look upon deer management with the same practical attitude they would apply to forestry, farming or cattle raising. However, in each one the basic principals are the same. In wildlife management the public lets sentimentality overrule practical considerations. The Wildlife profession has a long way to go before sound management will be accepted. Perhaps this review of Louisiana's past record will help formulate and sell a sound management program for the future.



A Turkey nest destroyed by predators! The eastern wild turkey, through stocking of wild trapped birds and management, is again becoming an important forest game species in Louisiana.

Game Research

ROBERT MURRY
Research Project Leader

This Division's game research program is designed to find better ways to practice the science of game management in Louisiana so that all citizens of the Sportsmen's Paradise can benefit. Game research findings are of no more than academic value when these findings are not applied to that growing body of knowledge presently used to manage the State's tremendous game potential. If we all agree to collectively take the position that there is no such thing as a "science of game management" then we should totally eliminate our modest game research budget. The annual saving would be enough to build a moderate sized bowling alley each year. We could get all of our management information from that vast array of barbers, embalmers, mechanics, lawyers, traffic cops, doctors, teachers, farmers, housewives, etc. who possess natural gifts of wildlife savvy.

During the recent past the advancements in game management have proved less newsworthy than have the few instances when strong local pressures have forced the Commission to set unrealistically restrictive deer regulations. The fact that many of us can look back to December 1, 1955, when the first legal deer was killed on a Louisiana game management area serves to help us measure the progress of this program. Several present employees still remember the dismay of many conscientious hunters when Red Dirt Game Management Area was opened for that first deer hunt. We have had occasion to reminisce with some of those veterans of the first hunt and laugh about the great changes that have occurred in public thinking regarding deer management on this area. Here the hunting public has grown to accept the philosophy of protecting deer in the summer and shooting them hard during the open season. It would be as difficult to sell all of them on bucks only hunting as it would be to get them to abandon electric lights in favor of kerosene lamps.

As a rapidly expanding human population takes stock of the diminishing areas with wildlife potential it is inevitable that professional judgment will some day be used in all decisions concerning the management of natural resources.

During the past two years several important game research objectives were attained:

(1) The feasibility of a telephone survey to estimate the dove kill was demonstrated by a survey completed after the close of the 1963-64 hunting season.

(2) Follow up studies of the Gum Cove black francolin release have revealed that this game bird is established in Northwest Cameron Parish and Southwest Calcasieu Parish.



ROBERT MURRY
Research Project Leader

(3) Field work has been completed on a population dynamics study of an annually hunted gray squirrel population. Data analysis has been postponed until one more hunting season of recoveries of marked squirrels is completed.

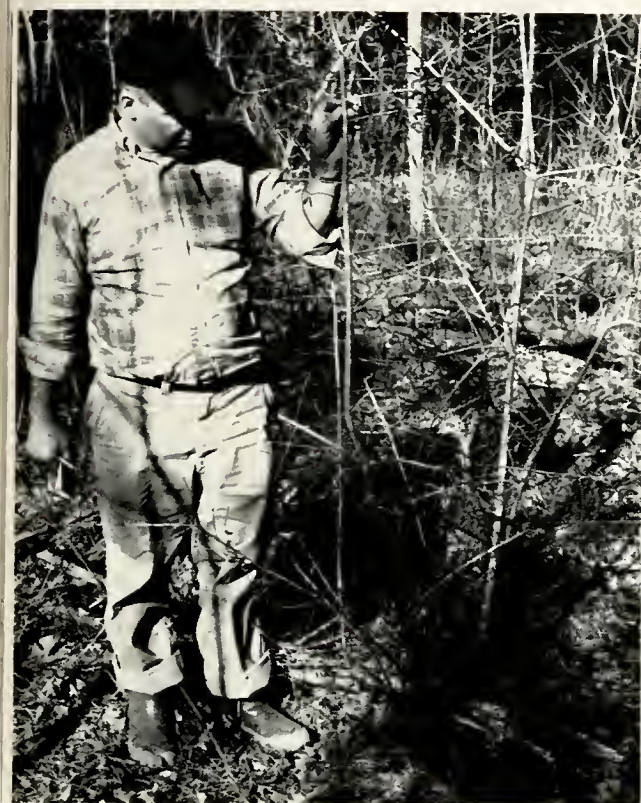
(4) A technique for capturing wild deer by orally administered tranquilizing compounds was developed. This capture method has already been useful in obtaining wild deer to stock new ranges in the state.

DEER INVESTIGATIONS

Deer Studies

DAN DENNET, JR.
Study Leader

The demand for deer hunting is now at an all time high. If the Louisiana Wild Life and Fisheries Commission is to meet its obligation to the deer hunters of Louisiana, a sound management program, based on scientific principles, is a matter of necessity. The current management program is based primarily upon field data collected by Commission personnel throughout the state. Numerous recent studies and investigations have accumulated much information concerning the ecology and life history of the white-tailed deer in Louisiana. In fact, almost every facet of the biology of the white-tailed deer has been touched by these investigations. Basic information on food habits, reproduction, general body condition, parasites, disease and capturing and transplanting techniques, has been gathered during the last biennium. The conclusions reached as a result of these studies are not necessarily complete answers to our management questions since the overall deer research program is designed to create a growing source of information that we can apply to intensive scientific management of our deer herds in Louisiana. It is imperative



Yaupon, a preferred browse plant, heavily browsed by deer on an overpopulated range.

that this type of approach to deer management be used if we are to realize the tremendous potential that the deer ranges of this state are capable of producing. Now, more than ever before, there is a desperate need for continuous sound management of our deer herds. This is due to the increased interest in deer hunting, a shorter work week, more money for recreation and an ever decreasing amount of wildlife habitat. Unless we manage wisely, future generations may well be acquainted with the traditional sport of deer hunting only through literature.

The greatest impediment to intelligent management has been our own failure to sell to the general public the principals of sound deer management. Strong emotions are invariably aroused when liberalizations of deer harvest regulations are considered.

GENERAL CONDITION STUDY

It is the objective of this study to make annual investigations of the physical condition of deer killed on the game management areas in Louisiana. The data obtained in these investigations keeps us informed of the physical characteristics of the deer found on these areas. It should also be stated that the efficiency of our management program can be tested by the collection of this physical data. Physical data includes ages,

weights and antler development. This information is tabulated and compared to previous similar data taken from the respective area to determine what changes have occurred among the animals of that particular herd. Table 1 shows the age-weight correlations for deer killed on some management areas during the 1964 and 1965 seasons. Annual fluctuations in average weights and fawn production normally indicate the condition of the animals of a given deer herd. Deer from overcrowded ranges can be expected to be of small stature, have poor antler development and low fawn production. It is also a matter of importance that animals from this type of deer herd are also more susceptible to ravages of malnutrition, parasitism and disease. On the other hand, a soundly managed deer herd should produce animals of large stature, respectable antler growth and high fawn production. In this case, an optimum balance between the deer herd and its range will guarantee minimum loss of animals due to malnutrition, parasites and disease.

Many sportsmen contend that deer die-offs on overcrowded ranges are of a very minor, or even non-existent, nature. However, several serious die-offs, as a result of over-population, have occurred here in Louisiana in recent years, and should not be regarded as accidental or as a phenomenon that occurs rarely. It is a matter of record that these die-offs had been predicted on certain over-populated ranges for several years, and unless a sound management program is started and adhered to more of the same will surely follow. Sound management includes the harvesting of either sex deer on an annual basis. There is no way known to manage deer herds efficiently without the harvest of deer of either sex. The deficiencies of our management program will be reflected by the data of the general condition study, and, for that reason, this investigation is one of the most important that we have under way at this time.

Table 1

COMPUTED LIVE WEIGHTS BY AGE CLASS OF DEER KILLED ON SOME LOUISIANA GAME MANAGEMENT AREAS DURING THE 1964 and 1965 MANAGED HUNTS

ALEXANDER STATE FOREST

Sex	Year	Age		
		6 Mos.	1½	2½ and Older
Male	1964	(22) 50.6	(10) 84.0	(24) 140.63
Male	1965	(15) 51.3	(11) 97.2	(15) 134.0
Female	1964	(14) 46.2	(14) 76.3	(43) 86.4
Female	1965	(12) 51.6	(9) 73.0	(18) 87.1

Table I—Continued
COMPUTED LIVE WEIGHTS BY AGE CLASS OF
DEER KILLED ON SOME LOUISIANA GAME
MANAGEMENT AREAS DURING THE
1964 and 1965 MANAGED HUNTS—Continued

CATAHOULA G.M.A.			
Sex	Year	Age	
		6 Mos.	1½ and Older
Male	1964	(50) 52.8	(51) 84.5
Male	1965	(51) 54.1	(55) 89.3
Female	1964	(46) 49.8	(28) 75.4
Female	1965	(66) 49.7	(31) 77.0

CHICAGO MILLS G.M.A.			
Male	1964	....	(37) 130.5
Male	1965	(164) 58.9	(112) 177.1
Female	1964	....	(12) 121.9
Female	1965	(185) 53.3	(119) 102.5

EVANGELINE G.M.A.			
Male	1964	(5) 63.0	(8) 91.1
Male	1965	(22) 61.6	(5) 95.3
Female	1964	(13) 58.1	(9) 79.8
Female	1965	(9) 50.1	(11) 84.8

FORT POLK G.M.A.			
Male	1964	(19) 50.7	(5) 90.4
Male	1965	(54) 52.9	(30) 96.6
Female	1964	(26) 49.8	(10) 73.7
Female	1965	(49) 51.0	(29) 74.5

GEORGIA PACIFIC G.M.A.			
Male	1964	....	(118) 94.1
Male	1965	....	(101) 93.9
Female	1964	....	"Bucks only" in 1964
Female	1965	....	"Bucks only" in 1965

JACKSON-BIENVILLE G.M.A.			
Male	1964	(26) 61.0	(28) 110.6
Male	1965	(24) 59.3	(29) 119.0
Female	1964	(26) 48.0	(9) 93.7
Female	1965	(26) 56.7	(18) 96.8

RED DIRT G.M.A.			
Male	1964	(26) 51.1	(44) 88.3
Male	1965	(49) 54.9	(40) 90.3
Female	1964	(50) 48.7	(39) 79.3
Female	1965	(32) 47.8	(20) 75.6

UNION G.M.A.			
Sex	Year	Age	
		6 Mos.	1½ and Older
Male	1964	(11) 61.1	(18) 117.9
Male	1965	(10) 61.5	(23) 105.2
Female	1964	(7) 54.6	(6) 94.3
Female	1965	(6) 65.4	(12) 90.4

WEST BAY G.M.A.			
Male	1964	(38) 49.7	(51) 80.3
Male	1965	....	(31) 91.6
Female	1964	(55) 44.8	(80) 75.6
Female	1965	....	"Bucks only" in 1965

NOTE: Age-weight correlations were made only on those areas where sufficient data were collected.

SOUTHEASTERN COOPERATIVE WILDLIFE DISEASE STUDY

For the last eight years Louisiana has been a participating member of the Southeastern Cooperative Wildlife Disease Study. It is the objective of this study to survey the parasites and diseases affecting wildlife species throughout the Southeastern United States. Although the intent of this study is to gather data on all types of wildlife, most of the work done to date has dealt with deer. Within the last two years the Southeastern Cooperative Wildlife Disease Study has conducted a survey of the ectoparasites of deer in Louisiana, and has made an intensive deer and parasite investigation of the deer on Georgia Pacific Wildlife Management Area near Bastrop, Louisiana. This latter investigation was conducted in August of 1965, and consisted of detailed autopsies of ten deer from that area. Studies such as this have been conducted in practically all of the Southeastern United States, and are part of an attempt to determine the cause, or causes, of disease and parasite outbreaks among southern deer herds. Unless we know and understand all of the factors pertaining to deer disease and parasite problems, we can never be in a position to derive the maximum benefit from our deer herds through scientific management. Several outstanding contributions to the field of wildlife management have been made by the Southeastern Cooperative Wildlife Disease Study.

Preliminary Parasite Survey

This survey is designed to determine the common parasites occurring in deer herds throughout the state. It is hoped that in due time every existing major deer herd can be surveyed and the parasites thus found can be identified and normal infection rates be determined. Very few deer go through life without having parasites of some form. It is our goal to determine what parasites normally occur in healthy deer, in what

areas of the state they can be expected, and what levels of parasitism are most common. All of the work done in Louisiana by the Southeastern Co-operative Wildlife Disease Study has dealt only with deer from overpopulated herds, and consequently, does not give a true picture of the parasite load carried by normal, healthy deer from uncrowded ranges.

We have received help on this project primarily from the Department of Zoology at Tulane University. We do plan, however, to make a renewed effort to locate a trained parasitologist to help us in the identification of those parasite forms discovered in these surveys. The lack of these services has hindered the progress made by this study in the past; however, in spite of this difficulty only three major deer herd areas remain to be surveyed. Thus far, five major deer herd areas have been surveyed and a preliminary list of the common parasites of the white-tailed deer in Louisiana has been prepared. By becoming familiar with the parasites commonly found in healthy deer, our technicians will be able to detect increases in normal parasite levels and become aware of trends toward overpopulation. This study has also served to familiarize technicians with standard autopsy procedures and gross internal anatomy of white-tailed deer.

RUMEN CONTENT ANALYSIS

The food habits of the white-tailed deer are still somewhat of a mystery to wildlife workers. These habits vary widely from area to area and from season to season. In an effort to understand more about the diet of the white-tailed deer, a long range study of deer stomach samples has now gotten underway. This study will involve the collection of sample material from the rumen of deer killed at various times during the year. During the winter the samples will be taken from deer killed by hunters. During the spring and summer months samples will be taken from deer killed by cars, poachers, and victims of fences and stray dog packs that we have occasion to find. Each field technician has been furnished with collecting jars to be used for taking of these samples of deer stomachs as the opportunity presents itself. In this manner we hope to collect samples from all parts of the state during all seasons of the year. Examination of the contents of these stomachs by microscopic techniques will enable us to identify much of the plant material found in these samples. The information gained in this study will broaden our knowledge of the food utilized by white-tailed deer and thus aid in the efficient management of this game animal.

TRANQUILIZING STUDY

Tranquilizing agents have been used by Commission personnel to capture and handle various



Jim Smith, biological aide of the Southeastern Co-operative Wildlife Research Unit, conducts routine field laboratory work on Georgia Pacific Wildlife Management Area deer taken for parasite and disease studies in 1965.

species of wildlife with a high degree of success. Initial testing of oral tranquilizing agents has now been completed and much of the recent work done under this study has related to particular field applications of tranquilizing techniques. Our capturing techniques are now developed to the point that a large degree of confidence can be placed in capturing deer for restocking purposes by the use of this type of drug. During the last two years many deer have been captured and handled using the oral tranquilizer Tranimul. During the coming spring a large trapping operation is planned which will employ the use of this oral tranquilizer. The deer caught in this and other similar operations will be used to provide nucleus deer herds for areas presently not having huntable populations.

Much of the work done in connection with tranquilizing agents recently has been centered around



Georgia Pacific Wildlife Management Area surveyed by deer parasite and disease study team. Left to right Louisiana biologists, Jerry Farrar and Dan Dennett, with Charles M. Marshal, assistant director of Southeastern Co-operative Wildlife Disease Study, examining one of 10 deer taken in 1965 for research purposes.

developing techniques for handling deer once they have been captured as a result of being overcome by the tranquilizing agent. Such things as methods of transportation, positions of carrying animals once they have been captured, and techniques of tying and holding the animals once they are in hand, have been of primary concern. All development of the techniques using a tranquilizing agent has been under the direction of Robert E. Murry, Research Project Leader.

In conjunction with the tranquilizing study, a project was originated to determine the feasibility of using an oral tranquilizing agent to increase egg production in the foreign game bird program currently underway here in the state. This study was started in May of 1965, and is scheduled to run until October of 1966. It will involve the feeding of calibrated amounts of tranquilizing agent to penned game birds. Egg production and fertility of each group of birds tested will be measured to determine what influence tranquilizing compounds will have on these birds. Several levels of treatment will be tested during this study. No report will be written until all phases of this project have been completed.

The rigidly controlled system of game management area hunting allows us to make another

important measure of the deer herds on the respective areas. Since we know the total number of hunters using an area, and the total number of deer killed, we can use the figures to calculate a ratio of hunter success. Table II presents the hunter success data for all of the more important game management areas in the state. "Bucks only" hunting will result in the hunter success decreasing, even in areas that are overpopulated. On the other hand, high hunter success is usually a companion to the "any deer" season on an intensively managed area. While the Commission has been often accused of wiping out deer herds in certain areas, our hunter success data does not support such accusations.

The rate of reproduction of any given deer herd is another method of determining whether or not the deer are in balance with their range. It is an accepted standard that adult does should, on the average, produce approximately 150 to 160 fawns per 100 adult females. Table III displays the calculated ratios for game management areas that provided sufficient data for analysis. These data strongly suggest that some areas *still* do not have the deer herds in balance with their habitat in spite of liberal seasons in the past. One would conclude that even a more liberal season is needed for efficient management.

Table II

HUNTER SUCCESS RATIOS FOR SOME LOUISIANA GAME MANAGEMENT AREAS DURING THE 1964 AND 1965 DEER HUNTING SEASONS

Game Management Area	1964			1965		
	Number of Hunter Efforts	Number of Deer Killed	Hunter Success Ratio	Number of Hunter Efforts	Number of Deer Killed	Hunter Success Ratio
Alexander Forest	1,343	142	1/9	1,663	83	1/20
Caldwell	641*	37	1/17	1,034*	59	1/18
Catahoula	4,206	347	1/12	4,885	359	1/14
Chicago-Mills	9,247*	256	1/36	12,867	1,617	1/8
East Carroll	375*	5	1/75	743*	25	1/30
Evangeline	1,420	62	1/23	1,998	83	1/24
Fort Polk	1,531**	93	1/16	3,103	249	1/12
Georgia-Pacific	6,490*	317	1/20	5,838*	165	1/35
Jackson-Bienville	2,847	144	1/20	3,132	174	1/18
Red Dirt	3,121	290	1/11	3,724	258	1/14
Russell Sage	682	34	1/20	833	43	1/19
Sabine	540	26	1/21	475	24	1/20
Thistlethwaite	No season in 1964			213*	1	1/213
Union	856	76	1/11	1,119	83	1/13
West Bay	5,607	335	1/17	4,130*	86	1/48
Zemurray Park	496**	37	1/13	456**	32	1/14
TOTAL	37,375	2,201	1/17	46,213	3,341	1/14

*"Bucks only" hunting.

**Manner in which hunts were conducted does not reflect an accurate measure of hunter success.

NOTE: All hunting is "any deer" hunting unless otherwise indicated.

Table III
DEER HERD REPRODUCTION RATIOS
Showing Number of Fawns Per 100 Does of
Age 2½ Years and Older

	<i>Adult Does</i>	<i>Fawns</i>	<i>Ratio</i>
Chicago Mills G.M.A.			
1964	...	...	...
1965	284	349	123/100
Catahoula G.M.A.			
1964	100	96	96/100
1965	107	109	102/100
Evangeline G.M.A.			
1964	13	18	138/100
1965	20	31	155/100
Jackson-Bienville G.M.A.			
1964	38	52	137/100
1965	48	50	104/100
Red Dirt G.M.A.			
1964	84	76	90/100
1965	74	81	109/100
West Bay G.M.A.			
1964	61	93	152/100
1965	...	...	...
Union G.M.A.			
1964	15	18	120/100
1965	18	16	89/100

*"Bucks only" during annual season—reproduction rate unknown.

RANGE STUDIES

LOUIS BRUNETT
Study Leader

Cooperative Deer Range Study

This study was undertaken to gain a better understanding of the interrelationships between various levels of deer populations and the ranges they occupy. It is being carried out by the Louisiana Wild Life and Fisheries Commission in cooperation with the Southern Forest Experiment Station and the Kisatchie National Forest of the United States Forest Service, and the Soil Conservation Service. The overall planning and establishment of the study was a joint endeavor of the Louisiana Wild Life and Fisheries Commission and the Southern Forest Experiment Station.

Each cooperator is responsible for specific segments of the study. The Southern Forest Experiment Station is responsible for the vegetative phase while the Louisiana Wild Life and Fisheries Commission is accountable for maintaining the proper number of deer in each enclosure, the biology of the study animals, and maintenance of fences. The Kisatchie National Forest furnished the study area and provides management of the timber. The Soil Conservation Service has assisted in making certain soil measurements and gives advice pertaining to the soil.

The area selected for installation of the study is typical of the loblolly-shortleaf pine-hardwood forest type. In that particular forest type Louisiana has approximately 4,012,000 acres in central, north, and northwest Louisiana. Practically all of this type is owned by the United States Forest

Service and large landowners. Most of it is open to public hunting.

The overall object of this study is to gain a better understanding of deer and their range in the loblolly-shortleaf pine-hardwood forest of Louisiana and the carrying capacity of this forest type. Specifically, this study has the following objectives under three different stocking rates:

1. To determine the availability of forage and the species preference by deer during the summer and winter seasons.
2. To determine forage "indicator" species that would serve as management guides in determining approximate deer stocking levels per unit of area and in regulating proper range use.
3. To determine the effects of different intensities of deer stocking and forage use upon the condition and trend of the range and forest reproduction.
4. To determine the production of oak mast and its influence upon forage use and deer condition.
5. To determine the physical response of deer to range conditions that prevail under three different levels of stocking and the prescribed forest management practices.

The study area was selected and a survey party located the fence line of each enclosure and enclosure by survey. A bulldozer was used to clear the fence right-of-way and excavate a pond, approximately one-quarter acre in size, in each



On overpopulated ranges deer often ride plants down to get to food that is out of their reach. That happened to this largeleaf gallberry.

enclosure. A nine foot deer proof fence was completed in January, 1961.

The enclosures were stocked with trapped deer at the rates of two, four, and eight deer for each of the three 160 acre enclosures.

Personnel of the Alexandria Research Center, Southern Forest Experiment Station, put in the study plots and necessary transects. The plots are timber inventory plots and forage production and utilization plots. The transects were established to determine range condition and trend. Mast traps were erected to collect acorns for production studies.

The end results of this study are expected to have considerable effect upon future deer management in this important timber type of Louisiana. A knowledge of the productivity of the particular range, as well as an understanding of the signs which indicate the degree of stocking, both must precede the setting of intelligent harvest regulations.

Range Surveys

To learn as much as possible regarding the various deer ranges of the State and the herds that occupy them it is important to inspect and record all pertinent information on the occupied ranges. This information is useful in making intelligent management recommendations for the various deer herds. It also enables a compilation of records of deer management regulations on the various ranges during the recent history of management. The inventories are conducted by trained personnel.

Before an area is inventoried or surveyed, the investigator checks previous survey reports and field notes. This gives an idea as to how the previous survey was made, what was found, and additional information he must look for on his survey. The investigator obtains a map of the area and studies it thoroughly as to road network and streams. A survey route is then planned.

The surveys are made by the investigator going into the area, and as he travels (by boat or vehicle) making stops and walking perpendicular to the line of travel. Stops are made as often as deemed necessary by the investigator. At each stop notes are made of occurrence and use of browse and sign such as tracks, droppings, live-stock, and dogs.

Local people as well as enforcement agents, Forestry Commission employees, and industrial foresters are contacted. A narrative report is prepared on each area surveyed. The report includes a description of the area, a history of the deer herd and hunting seasons, factors adversely affecting deer, factors that affect hunting, condition of the range, condition of the herd (if determined), economic liability of deer in the area, recommendations for the coming season, the chances of getting the herd managed along

sound biological principles, and an estimate of needs to facilitate deer management in the area. All the deer range survey reports are forwarded to the Fish and Game Division office where the information is available for use in the setting of deer hunting regulations.

Introduction of Desirable Understory Plants to Commercial Forests

Large landowners are planting vast acreage, mostly in cutover pine land, to pine. Some of the landowners and timber managers are interested in producing deer browse, but at the same time produce the maximum of commercial timber. A study was designed to gather information and to demonstrate the effects planted pine and deer browse species have on each other. The objective of this study is to determine if deer browse plants can be introduced into pine forests and if competition will exist between the plants and pine and at what stocking rate competition occurs.

The fruits of various deer browse species were collected to conduct a germination test on their seed. Fruits collected were whitebay, redbay, arrowwood, possumhaw, largeleaf gallberry, strawberry bush, and yaupon. Germination tests included planting the whole fruit and planting the seed removed from fruit. The germination tests are to the point that field tests can be conducted.

Study plots will be established with pine and deer browse plant seed at various seedling rates to try to accomplish the objectives of this study.

Palatability of Sprouts Produced by Herbicide Treated Browse Species

Herbicides are playing an important part in hardwood and brush control in pine forest management. Large landowners use herbicides primarily to kill undesirable species so pine can be established. The chemical most widely used is 2-4-5T. The amount of 2-4-5T used is usually 2 pounds of four pounds acid equivalent per gallon, mixed with water and diesel oil as carriers to make a total of five gallons. This amount is used on one acre and is applied either by aerial spray or by mist blower. When some species are treated with the herbicide the main stem is killed and an abundance of sprouts are produced around the root collar.

The objectives of this study were to determine if sprouts produced by 2-4-5T treated browse species retained the herbicide, the effects the herbicide had on the nutritional value of the plant, and the effect it had on their palatability. It was attempted to determine if deer would make a choice between sprouts produced by plants treated by various methods.

To accomplish the objectives of the work plan a study on a cattle free area on the Red Dirt

Game Management Area was established. The study area was situated in a stream bottom that was extremely wide. Sprouting of deer browse species was induced by three methods: (1) herbicide treatment, (2) burning, and (3) cutting.

The study area was divided into four plots. Each plot was approximately one acre in size. Desirable and intermediate preference deer browse species on one plot were treated with 2-4-5T. The herbicide was applied to each plant through the use of a back type sprayer.

Deer browse species of desirable and intermediate preference on one plot were cut with a brush blade. One plot was burned and one plot was not treated for use as a control.

Samples of sprouts from whitebay, redbay, maple, dogwood, azalea, blackgum, and largeleaf gallberry, were clipped from all three treated plots. Growth of one year was clipped from the same species on the control plot. These samples were taken to the Cooperative Wildlife Research Unit at Louisiana State University. There they were oven dried and ground. Chemical analysis for the retention of herbicide and for the per cent of crude protein, calcium, and phosphorus is being performed by the Feed and Feeding Laboratory at the University.

Field observations showed there was an abundance of sprouts produced on both the burned and cut plots. These sprouts had made luxuriant growth. Sprouts produced by the herbicide treated plants were not very abundant. The sprouts that were produced were generally growing rather slow. There was no significant difference in the amount of deer usage between the burned and cut plots. Deer tracks were abundant in both. Browse sign on the herbicide treated plot could not be found. Deer tracks were absent in this plot.

It was noted in the burned and cut plots that there was very little usage on yaupon, redbay, and whitebay. These species are considered desirable on this particular range. On both plots practically every sprout on blackgum, maple, and water oak had been browsed. These species are considered desirable on this range. On both plots the sprouts of two intermediate species, spring huckleberry, and azalea were highly utilized. The sprouts of witch-hazel, an undesirable species, were used heavily. Dogwood on both plots, put on an abundance of sprouts that were lightly utilized. It is believed the abundance of luxuriant sprouts growth on the burned and cut plots attracted the deer.

Effects of Burning in Longleaf Pine and Loblolly-Shortleaf Pine Timber Types

Fire, used under controlled conditions, is being used by timber companies and the United States Forest Service as a management tool in the longleaf pine and loblolly-shortleaf pine timber

types. A controlled burn is made under certain moisture, wind, and fuel requirements. These requirements are easily recognized by the trained forester. Controlled burns in established stands of pine are conducted during the winter months. Burning in the summer is done to a certain extent by timber companies and experimentally by the United States Forest Service, to control hardwoods, brush, and reduce the rough so pine can be established.

A study was initiated to determine the effects of burning on deer browse plants. The specific objectives are: (1) to determine the effects of summer burning on deer browse species and (2) to determine the effects of winter burning every year, every two years, and every three years on deer browse plants in the longleaf pine and in the loblolly-shortleaf pine-hardwood timber type.

On the Red Dirt Game Management Area, in the stream bottom of Steep Hill Creek, two adjacent plots, each three acres in size, were established. One of these plots was burned in June, 1965. The other plot will not be burned and will be used as a control. The treated plot is to be burned every two years, in June, until it is burned three times.

On the Red Dirt Game Management Area, four plots, each two acres in size, were established. These plots begin in the creek bottom of Steep Hill Creek, and extend out onto the hillside. Three of the plots were burned in March, 1965. One plot will not be burned as it will be used as a control. Hereafter the plots described above will be burned in the following manner: (1) one burned every year, (2) one burned every two years, and (3) one burned every three years. These plots will be used to accomplish the objectives related to the longleaf pine timber type.

On the Catahoula Game Management Area, in the loblolly-shortleaf pine-hardwood timber type, four plots were established. Each of these plots are two acres in size. The plots are side by side beginning in a stream bottom and extending out onto a hillside. Three of these plots were burned in January 1965. One plot will not be burned as it will serve as a control. These plots are to be burned one every year, one every two years, and one every three years.

After the 1965 growing season deer browse species on the above plots were marked and checked. They were marked so the same plant can be checked each year. The plants were checked by noting the condition of the main stem, counting the number of sprouts produced by each old stem and measuring the total length of the main stem of each sprout.

The collected data have not been analyzed.

Winter Plantings For Deer

In the fall of each year considerable food patch acreage on the game management areas is

planted to wheat. Deer use this wheat heavily each winter.

The objectives of this study are: (1) To determine the affects various fertilization rates have on wheat production, (2) Determine the practicability of establishing honeysuckle on plots for deer, (3) To determine the amount of forage produced per acre of honeysuckle plantings.

In a 40 acre deer corral on the Red Dirt Game Management Area an effort was made to establish two acres of honeysuckle. The honeysuckle plants were set out and had about a 50 percent survival. The surviving plants did not make much growth. The efforts to establish the full two acres of honeysuckle will be continued in order to attain those study objectives pertaining to this plant.

To determine the effects various fertilization rates had on wheat production a study plot was planted on Red Dirt. The plot was marked off into five 10 feet wide strips. On all strips wheat was planted at the rate of two bushels of seed per acre. The strips were fertilized at the following per acre rates: (1) 200 pounds of 12-12-12 when planted and top dressed later with 50 pounds of ammonia nitrate, (2) 400 pounds of 12-12-12 when planted, (3) 200 pounds 12-12-12 when planted, (4) 200 pounds 12-12-12 when planted and top dressed later with 200 pounds of 12-12-12, and (5) no fertilizer.

To protect some wheat from being utilized by deer four protective cages constructed of 1x2 inch weld wire were used on each strip.

On April 8, 1965, the wheat under the protective cages was clipped and weighed to determine the amount produced on each strip. The clipped wheat produced the following amounts of green forage projected to an acre basis:

- (1) 200 pounds 12-12-12 when planted and top dressed with 50 pounds ammonia nitrate—8,250 pounds.
- (2) 400 pounds 12-12-12 when planted—8,560 pounds.
- (3) 200 pounds 12-12-12 when planted—7,376 pounds.
- (4) 200 pounds 12-12-12 when planted and top dressed with 200 pounds 12-12-12—13,126 pounds.
- (5) No fertilizer—control strip—2,500 pounds.

The study of the effects various fertilization rates have on the production of wheat is being continued.

TURKEY RESEARCH

While the stocking of good turkey range with high quality wild birds has proceeded at an increased pace we have only aimed our research at those studies that have gone on for several years.



Conclusion of a succesful hunt! The aim of all game research and management.

As reported in the TENTH BIENNIAL REPORT, the turkey stocked to Red Dirt have continued for fare poorly. The wild trapped turkey released on Bodcau appear to have established a population there. Since the Red Dirt birds have all descended from game farm stock we will avoid this source of turkey for restocking in the future.

One turkey study in Morehouse and Ouachita Parishes has provided some information on brood size, poult mortality, hatching dates and consolidation of broods. As populations develop on our recently stocked ranges we expect to gather a great deal of information calculated to assist us in the future management of this fine game bird.

MOURNING DOVE INVESTIGATIONS

LARRY SOILEAU

Dove Study Leader

Telephone Harvest Survey

Dove management for the past decade has been characterized by a gradual relaxation of hunting regulations. The call-count survey of breeding birds has revealed that the overall national dove population has generally increased despite these more liberal regulations. Experience has demonstrated that relaxed hunting regulations with corresponding increased recreation has not reduced the following year's dove population. The effects of these hunting regulation changes on dove kill are not, however, fully understood. The major efforts of the dove study during the past two years have, therefore, been directed toward obtaining a reliable estimate of the total dove kill in the state.

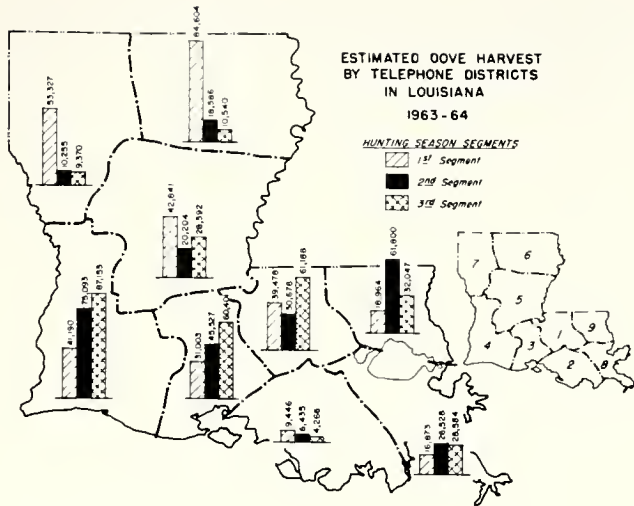
The most obvious means of obtaining this harvest information is the interview of dove hunters in the field or a mail survey of hunting license holders. Both approaches presented insurmountable problems. The hunter bag check could not be

used because of insufficient personnel to interview in the field the large number of hunters required to estimate kill over a large area, while the survey of hunting license holders was impractical because a recent listing of license purchasers was unavailable.

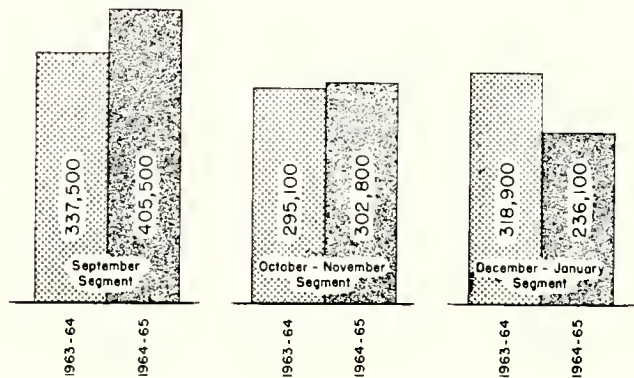
The problem thus became one of obtaining a listing of persons to sample in order to obtain information about dove kill. After exploring numerous listings, telephone directories seemed best suited to the needs at hand. Investigations involving the use of a listing of residential telephones for a survey of dove hunters were begun in 1960 in the Acadia Parish area. Calls made in Eunice and Rayne at the end of each segment of the 1960-61 split dove hunting season indicated that a telephone interview could be used to obtain dove kill information with excellent results. Another phase of this study revealed that over 85% of the hunters contacted while dove hunting in Acadia Parish lived in a household having a telephone. Estimates obtained by a telephone survey will, necessarily, omit doves killed by persons living in households without a telephone. Despite this shortcoming, the telephone survey provides one of the most efficient means presently available for estimating dove kill. This kill estimate, while not complete, is adequate for management purposes.

Armed with the information and experience gained during the 1960 Acadia Parish research study, the Louisiana Wild Life and Fisheries Commission undertook to obtain an estimate of the statewide dove kill during the 1963-64 hunting season. The first step in this operation was to secure a listing of all telephone exchanges and residential subscriber numbers in the state. This information, which contained both Bell and independent exchanges, was obtained from the Southern Bell Telephone and Telegraph Company. It was found that Louisiana has approximately 672,000 residential subscribers divided into nine telephone districts. For this survey a total of 34 exchanges were randomly selected from throughout the state. From these selected exchanges approximately 45,000 subscribers were questioned by telephone about their dove hunting activities. One-third of these households were called at the end of each segment of the hunting season and information concerning the number of dove hunters in the household, the number of hunting trips and kill was recorded. From this large volume of data estimates of hunters, trips and kill for each hunting season segment and telephone district were calculated (Table I). The table represents the hunting activities of persons living in a telephone district and not the hunting trips and kill which occurred in that district. It is probable, however, that most of the hunters living in a district hunted there also.

During the 1964-65 hunting season the Com-



Comparison of estimated dove kill by persons with telephones for the 1963-64 and 1964-65 hunting seasons



mission again undertook to estimate the dove kill in the state. The survey was undertaken on a much reduced scale in order to estimate statewide kill by season segment only and not by telephone district. For the survey a total of 3,250 telephone subscribers were selected at random from throughout the state with one-third being interviewed by telephone immediately following each of the three segments of the dove season. The randomly selected subscribers were questioned and information concerning the number of dove hunters in the household, the number of hunting trips and kill was recorded. From this information estimates of hunters, trips and kill for each hunting season segment were calculated (Table II).

An estimated total of 944,400 doves were killed in the state by persons residing in a household with a telephone during the 1964-65 hunting season. This total does not differ significantly from

the 951,500 doves killed during the 1963-64 hunting season. This statewide kill was divided among the three season segments as shown in the accompanying figure.

Thus, the telephone survey has provided an efficient means for estimating the size and distribution of the statewide dove kill during the past two years.

Table I
ESTIMATES FROM DOVE HUNTERS RESIDING IN HOUSEHOLDS
WITH A TELEPHONE, 1963-64 HUNTING SEASON

Segment*	Estimated Hunters			Estimated Trips			Estimated Kill		
	1	2	3	1	2	3	1	2	3
DISTRICT									
1	8,634	4,388	3,380	15,956	8,073	12,023	39,478	30,678	61,188
2	1,419	1,161	802	5,723	2,459	2,904	9,446	6,435	4,266
3	5,778	4,221	4,335	13,976	11,866	15,820	31,003	45,527	60,401
4	7,524	6,518	5,120	16,862	18,791	17,889	41,190	75,093	87,155
5	6,550	3,336	3,039	14,049	6,365	10,307	42,641	20,204	28,592
6	9,952	2,368	572	30,373	4,769	1,588	84,604	18,586	10,540
7	8,091	2,694	1,642	15,865	5,821	4,519	53,327	10,255	9,370
8	3,770	2,127	2,641	7,270	5,962	6,398	16,873	26,528	25,384
9	3,178	3,195	2,382	6,353	10,663	6,697	18,964	61,800	32,047
STATEWIDE	54,896	30,008	23,913	126,427	74,769	78,145	337,526	295,106	318,943

*Season Segments:
1. September 2-16.
2. October 12-November 3.
3. December 7-January 7.

Table II
ESTIMATES FROM DOVE HUNTERS RESIDING IN HOUSEHOLDS
WITH A TELEPHONE, 1963-64 AND 1964-65 HUNTING SEASONS

Hunting Segment	Estimated Hunters		Estimated Trips		Estimated Kill	
	1963-64	1964-65	1963-64	1964-65	1963-64	1964-65
Sept.	54,900	61,800	126,400	147,100	337,500	405,500
Oct.-Nov.	30,000	24,700	74,800	78,200	295,100	302,800
Dec.-Jan.	23,900	24,600	78,100	58,500	318,900	236,100



More information to aid dove management. Jerry Farrar bands and records data from dove trapped at Selman Field east of Monroe. Continued research benefits sportsmen in the form of bag limits and season lengths.

RABBIT INVESTIGATIONS

JACK O. COLLINS

Study Leader

The sport of rabbit hunting is increasing yearly in Louisiana. Even a decade ago this type hunting was rare in the northern part of the state, but the trend is changing rapidly. For many years this type of recreation has been popular from Central Louisiana southward to the coast.

Two species of rabbits occur in the state, cottontail and swamp rabbit, both of which are quite common though available hunting localities where good populations can be found are becoming fewer from year to year. Primarily, this is because of shrinking natural range due to improved farming techniques and the changing concept of land use, and restricted hunting privileges. As a consequence of hunter numbers increasing plus natural range and hunting privileges being reduced, there is a constant need for more knowledge on how to provide more rabbits in less space for the hunters of Louisiana. A comprehensive research program is needed to provide these facts.

Most of the material included in this report encompasses work conducted between January 1, 1964 and December 31, 1965. During this period the rabbit research was concentrated mainly on (1) devising and improving new trapping techniques, (2) gathering data on population trends, and (3) work towards establishment of a habitat study in relation to cottontail rabbits. A brief resume of other phases of the project will also be included.

Trapping Techniques

A trapping and tagging program was started on the Thistlethwaite Game Management Area, St. Landry Parish, in July, 1962. A method employing the use of box type traps with bait was used until the spring of 1964. Between January 10, 1964 and March 26, 1964 box traps varying in number from thirty to ninety were operated on the area. During this period twenty-two different rabbits were caught. Each animal was ear tagged and released at the trap site. Four of those caught were retraps originally trapped in the spring of 1963.

Several kinds of bait, including onions, potatoes, hen scratch, commercial rabbit pellets, and apples, were used, but delicious apples proved to be the only acceptable one to rabbits.

For research purposes a randomly trapped rabbit is more desirable and since bait trapped animals do not fit into this category the technique was modified in July, 1964. Not only was the method for catching rabbits altered, but also trapping sites were expanded to include locations in Evangeline and Iberia Parishes.

One hundred traps were constructed of 1" x 2"

fourteen gauge weld wire. The traps measure 9" x 10" x 36". Wire wings made of 20 gauge poultry wire and held erect by three foot long stakes extend from fifteen to thirty feet on both sides of each trap. For experimental purposes both two and three foot high wings were employed. Both 1" and 2" mesh sizes were used. At the end of each wing there was an approximate 45° angle in the fence. At each of these points a trap was placed. Each fence may contain from one to a dozen traps. Thus, it may be described as a zig zag trapping technique.

All traps are wired open at both ends except during trapping periods and no bait is used.

The zig zag technique is proving successful since all animals are randomly caught, the catch success is relatively high, and the cost of the entire operation is very low when compared to box type trapping with bait.

Population Trends

Data relating to population trends are gathered each month of the year in the eight administrative districts of the Fish and Game Division. The work is assigned to all biologists of the Pittman-Robertson section of this division. The following method is used to obtain the data which is compiled and analyzed at the end of each fiscal year by the study leader.

When traveling to perform routine duties the driver records the number of dead and live rabbits observed. Also, the speedometer reading is recorded at the beginning and completion of each trip. This information is kept only during daylight hours, and by day, month, and year. Calculations are made on the basis of the number of rabbits observed for each 100 miles of travel. The annual index figure was 0.52 for the twelve month period, July 1, 1964 through June 30, 1965. During the five preceding study years the average was 0.55, 0.63, 0.66, 0.69, and 0.70, respectively.

Cottontail Habitat Study

In the planning stages a considerable amount of work has been put forth towards establishment of this job. The major objective is to investigate techniques for developing maximum cottontail populations through habitat alterations.

Details of the plan are as follows: A rabbit proof fence will be constructed around 80 acres. The fence will be about five feet high. This area will be subdivided into 16 five acre plots. Rabbit proof interior fences will be used. After the pens are completed and habitat development begins two pairs of rabbits will be placed in each. After specified periods of time the number of rabbits in each pen will be counted in order to determine population changes as affected by various types of habitat development.

This study is designed to provide answers to questions often asked by sportsmen throughout the state. Many use beagles in the pursuit of cottontails and are interested in developing better habitat which in turn will provide more rabbits on a per acre basis.

Hunting Success Trends

One phase of the rabbit research program which was terminated in June, 1964 consisted primarily of compiling information solicited from rabbit hunters located throughout the state. When the job started in 1961 hunters were asked to keep records of their hunts for at least three successive seasons. Information recorded included the number of rabbits bagged per hunt and the number of people participating in each hunt. Forms were provided for keeping these records along with stamped return address envelopes to be used at the end of the hunting season. This plan was designed only to determine trends in rabbit hunting success in various areas of the state. This study revealed that only seldom did a group of hunters bag a party limit of rabbits on a single hunt. Usually the average kill per hunter effort was less than two rabbits. The average number of hunters per hunt was 3.3 in 1961, 3.8 in 1962, and 2.8 during the hunting season of 1963-64. In the 1961-62 season the number of rabbits bagged per hunt was 3.7, it was 4.5 in 1962-63, and in 1963-64 the figure was 4.6. The number of rabbits bagged per hunter effort during the 1961-62 season was 1.1. It increased to 1.2 in 1962-63, and in the third year of study the figure was 1.6.

Ageing Technique Studies

A preliminary job which was initiated in June, 1962 was terminated in June, 1964. Entitled "Ageing Rabbits by the Lens Technique", it involved classifying rabbits as adults or juveniles according to weight of the eye lens. Eyeballs from approximately 100 rabbits were used in this investigation. Results of this investigation will be of value when further studies related to this subject are started.

With more people having more leisure time for recreation, and with the growing interest in rabbit hunting, it is hoped that the rabbit research program of Louisiana Wild Life and Fisheries Commission will be adequate to meet the needs of the people in this state.

SQUIRREL INVESTIGATIONS

J. B. KIDD

Supervisor, District VI

In 1965 the Louisiana Wild Life and Fisheries Commission terminated its intense squirrel research program which it had been conducting on

the Thistlethwaite Game Management Area since 1961 to the extent that the trapping and marking of squirrels have been discontinued. The area will continue to be hunted by daily permit thereby enabling individual bag checks to be made so that all tagged squirrels killed by hunters can be recorded and used in further analysis of data from the area.

The purpose of this study is to estimate all populations before hunting to determine the percent kill of the population by hunters and to compute hunter success and natural mortality.

During the years 1964 and 1965 squirrel trapping on the 10,000 acre area netted 99 squirrels marked in 1964 and 61 in '65. By checking each completed hunt individually it was determined that the total kill from the area in 1964 was 4419 squirrels as compared to 3735 killed in 1965. Tag return information from hunters showed that 20 percent of the population was removed by hunters in 1964 and 28 percent in 1965. The average kill for the two years was nearly equal—2 squirrels bagged per hunter in 1964 as compared to 1.9 in 1965.

Both years of 1964 and 1965 were hurricane years which hit the area badly and no doubt limited hunter success. In 1964 the great storm struck during the opening weekend and eliminated one day's hunting completely and limited the number of hunters on the other considerably. It is during the opening weekend that 1/3 to 1/2 of the total squirrel kill may be made. The woods were littered with fallen debris making still hunting difficult and generally discouraging squirrel hunters. Tag return information from the 1964 hunt indicates that the squirrel population on the area was high, but the effect of the storm severely hampered hunting success.

In 1965 the hurricane struck two weeks before the season opened and produced a different detrimental effect than in 1964. Young fall squirrels which were on the verge of emerging from their leaf nests were no doubt destroyed in large numbers. Bag check information revealed the absence of the fall segment of the population which supports the above statement. Fallen debris was considerably less in 1965 and was not a limiting factor.

Below are some other interesting figures gathered from the area during the two year period.

TAG RETURN AND BAG CHECK ANALYSIS

	1964	1965
Total Pop. Est. Before Hunting	21,228	13,080
% Kill of Tot. Pop. By Hunters	20	28
Total Squirrel Kill	4,419	3,735
No. Sq. Remaining After Hunting	16,809	9,345
Avg. Kill per Hunting Effort	2.0	1.9

WATERFOWL

CLARK HOFFPAUER
Study Leader

Waterfowl inventories are carried out from September 1 to April 1 of each year in order to gather essential information on migration, distribution and numbers of ducks, geese and coots wintering in Louisiana. In the past this information proved extremely useful in securing the experimental teal hunting season for Louisiana, the bonus bag limit on scaup, and even more important, preventing a closed hunting season on ducks in the Mississippi Flyway. This information also has proven valuable in preserving highly important waterfowl areas such as Catahoula Lake, which would have been converted to an impoundment and destroyed for ducks had it not been

proved from census figures that it was irreplaceable as a waterfowl wintering area in Louisiana. A total of 220-250 flying hours is required to complete the annual census schedule. Most aerial censuses are of the transect type, but the total count technique is also used to afford a comparison between the two methods. The censuses are conducted in a Cessna 210, by a pilot and observer flying at 75 feet altitude and 100 mph. airspeed.

In 1964, Louisiana wintered approximately 18.6% of all the ducks found in North America. The total North American duck population was 26,292,000 birds in 1964. Of this number 10,863,000 were found in the Mississippi Flyway and Louisiana contained 45% of this total. (See Tables I & II)

Table I
LOUISIANA WATERFOWL INVENTORY—1964-1965

Species	Sept. 24 - 27	Oct. 26 - 28	Nov. 23 - 27	Dec. 18 - 22	Jan. 3 - 9	Feb. 7 - 12
Mallard	0	34,525	419,000	567,000	651,000	229,000
Black Duck	0	0	8,800	11,500	7,000	3,500
Gadwall	3,500	330,400	482,000	1,105,000	1,152,000	786,000
Baldpate	15,300	237,850	466,000	620,000	637,000	393,500
Green W. Teal	11,800	226,900	480,000	547,000	633,000	615,000
Blue W. Teal	154,000	126,750	125,500	103,000	94,000	88,000
Shoveler	18,550	118,200	167,000	169,000	195,000	130,000
Pintail	58,300	272,275	789,000	856,500	860,000	497,000
Wood Duck	No count	No count	No count	No count	124,000	104,000
Mottled Duck	30,000	38,000	49,000	49,000	52,000	41,500
Redhead	0	10	1,300	1,500	21,000	15,500
Canvasback	0	5	3,300	9,200	17,000	12,000
Scaup	0	2,750	338,000	411,000	344,000	421,500
Ringneck	0	13,300	30,200	32,200	88,000	98,000
Ruddy	0	0	300	1,500	14,000	6,500
Merganser	0	100	5,500	6,000	10,000	10,500
TOTAL	291,750	1,401,065	3,864,900	4,489,400	4,899,000	3,461,500
Canada Geese	*	*	*	*	7,115	*
Whitefront G.	*	*	*	*	33,775	*
Blue & Snow Geese	*	*	*	*	394,220	*
TOTAL	*	*	*	*	435,110	*
Coots	0	227,920	563,000	579,000	2,001,075	1,914,000

*Only the mid-winter survey figures used. Conducted by U. S. Fish & Wildlife Service.

Table II
LOUISIANA WATERFOWL INVENTORY—1965

Species	Oct. 11-15	Nov. 3-8	Nov. 15-24 Dec. 1-6
Mallard	1,800	91,000	639,000
Black Duck	0	1,500	9,500
Gadwall	111,000	446,000	933,000
Baldpate	138,000	225,000	446,000
Green W. Teal	102,000	178,000	732,000
Blue W. Teal	283,500	105,500	360,000
Shoveler	80,700	100,500	257,000
Pintail	127,500	213,000	1,008,000
Wood Duck	*	*	*
Mottled Duck	41,000	55,000	55,000
Redhead	0	1,550	25,000
Canvasback	0	2,000	3,600

Scaup	0	608,000	390,000
Ringneck	5,000	19,500	32,000
Ruddy	3,500	7,500	5,000
Merganser	0	5,250	4,000
TOTAL	894,000	2,059,300	4,899,100
Canada Geese	**	3,500	3,500
Whitefront G.	15,000	53,000	53,000
Blue & Snow Geese	**	382,000	382,000
TOTAL	15,000	439,000	439,000

*Good number of woodduck seen, but not censused.
**Will be censused at a later date by Fish and Wildlife Service.

Louisiana Duck Kill

The lesser scaup kill is controlled by whether or not these ducks move into the coastal marshes during the hunting season as well as their total numbers. During some winters scaup concentrations remain out in the Gulf of Mexico throughout the hunting season and never become available to the hunters who shoot in the marshes. During the 1962-63 season scaup were seen in very large numbers (1,600,000 mid-winter inventory) off shore in the Gulf of Mexico and in the big bays and lakes. Very few of these birds moved into the marshes during the hunting, thus a small kill. In the past 63-64 season, scaup figures were around 909,000 in mid-November. Most of these birds, however, used the marshes and therefore occupied a larger percentage of the total bag because of their availability to the hunter.

PER CENT SCAUP IN LOUISIANA DUCK BAG

	1962-63		1963-64	
Scaup	31	1.6%	638	13.4%
Other Ducks	1,987	98.4%	4,766	86.6%

The above samples were collected at road check stations, hunting clubs and public shooting areas.

In the past there has been some concern about the undue occurrence of ring-necked ducks in the bonus scaup bag. To more fully explore the possibility that this was occurring, and to determine to what extent, a study was started prior to the 1963-64 hunting season. The main reason that the occurrence of ring-necked ducks in bonus duck bags was obviously an identification problem and the chance that in some areas the scaup and ring-necked would occur together.

Three duck clubs in southeastern Louisiana were asked to save the bonus duck wings with no explanation given as to the reason. One club in southwest Louisiana was visited daily and the bonus bag ducks examined. The take there was rather insignificant as only 22 scaup and 4 ring-neck ducks were found in the total bag of 685 ducks examined.

Table III
LOUISIANA DUCK KILL

Species	1963		1964	
	No. Killed	% of Total Bag	No. Killed	% of Total Bag
Mallard	225,500	25.9	269,700	23.2
Mallard X Black .....	.....	0.0	1,162	0.1
Mallard Domestic .....	.....	Tr.	.....	Tr.
Black Duck	4,350	0.5	4,640	0.4
Mottled Duck	25,250	2.9	46,400	4.0
Gadwall	71,400	8.2	108,100	4.3
American widgeon	40,000	4.6	77,800	6.7
Green W. Teal	54,000	6.2	89,500	7.7
B. W. & Cinn. Teal	38,300	4.4	41,800	3.6
Shoveler	23,500	2.7	36,000	3.1
Pintail	56,600	6.5	110,400	9.5
Wood duck	88,800	10.2	95,300	8.2
Redhead	1,740	0.2	4,640	0.4
Canvasback .....	.....	0.0	9,300	0.8
Greater Scaup	33,480	0.4	4,640	0.4
Lesser Scaup	187,200	21.5	149,900	12.9
Ring-necked duck	36,500	4.2	82,500	7.1
Goldeneye	870	0.1	3,480	0.3
Bufflehead	1,740	0.2	6,900	0.6
Ruddy Duck	2,600	0.3	9,300	0.8
Scoters .....	.....	Tr.	.....	0.0
Old Squaw	87	0.1	.....	0.0
Eider .....	.....	0.0	.....	0.0
Large Merganser	870	0.1	1,160	.1
Hooded Merganser	6,100	0.7	6,900	.6
Other ducks .....	.....	Tr.	.....	0.0
TOTALS	868,887	...	1,159,522	...

*Computed from wing survey report and duck stamp sales.

Table IV

LOUISIANA DUCK STAMP SALES COMPARED TO BAG LIMIT FIND

Year	Stamps	Bag Limit
1960-61	66,734	4 daily, 8 possession, no restriction on mallards
1961-62	63,741	3 daily, 6 possession, no restriction on mallards
1962-63	45,644	2 daily, 4 possession, 1 mallard in bag
1963-64	66,672	4 daily, 8 possession, 2 mallards
1964-65	84,957*	4 daily, 8 possession, 2 mallards in bag

*1964-65 season sales based on $\frac{3}{4}$ sales only.

Wood Duck Trapping and Banding

This project is carried out in cooperation with the other 13 states in the Mississippi Flyway Council. Louisiana banded 97 wood ducks in the 1963-64 breeding seasons. This work is undertaken in order to gather information on migration, distribution and kill of this important species. Such information as age ratios, and hatching success are also determined from the banding.

Cooperative Canadian Banding

This project is one of the oldest waterfowl research projects in the nation, starting about 1936. As time progressed it was evident that an increase in the banding effort in Canada was necessary. To help the Fish and Wildlife Service each state offered the assistance of one or two men to help in Canada with the banding operation and Louisiana has been contributing personnel service since 1954. In 1965 the banding effort was greatly curtailed, thus no one from Louisiana went to Canada. In 1964 Mr. Ted Joanen, Refuge Division Biologist, went to Canada on this project and worked with a crew that banded 2,933 ducks. His report follows: "I left Louisiana on July 24 enroute to Regina, Saskatchewan, which was the rendezvous point for all banding crews. We picked up the necessary equipment at Regina, then left for Watrous, Saskatchewan on July 31. We met Mr. Thomas Wright, Royal Canadian Mounted Policeman of Imperial, who assisted us in the location of suitable duck concentrations and by August 7 had set up the traps and caught the first ducks.

All banding, done by this crew, was done on Lake Martin which is a Ducks Unlimited Project and Last Mountain Lake. Lake Martin was trapped first and after August 20 we moved the entire operation to Last Mountain Lake.

During the 5 weeks of trapping, the two-man crew to which I was assigned banded nearly 3,000 ducks. The species composition of the catch is included in Table V.

We terminated the assignment on September 4

and placed all equipment in storage in Regina. I returned to Louisiana on September 10."

The analysis of the band recovery data will be completed and reported by the U. S. Fish and Wildlife Service.

Table V

SPECIES AND AGE COMPOSITION OF DUCKS BANDIED ON LAKE MARTIN AND LAST MOUNTAIN LAKE, SASKATCHEWAN, BETWEEN AUGUST 7 AND SEPTEMBER 4, 1964

	Live	Imm.*	Mat.*
Mallard	40	415	210
Pintail	1	586	19
B. W. Teal	0	497	899
G. W. Teal	0	180	141
Widgeon	2	2	1
Red Head	5	7	11
Gadwall	6	0	1

*Immature.

**Mature.

Mottled Duck Transplant Study

The mottled duck has been a traditional Gulf Coast nester and remains in Louisiana during the winter months. It is thought that if these birds could be introduced into North Louisiana they would stay in the area of release and reproduce. This is one more method of trying to provide hunters with a huntable population of waterfowl. The restricted seasons and bag limits are also another reason for this project.

Two release sites were selected, one near Collinston, Louisiana and one near Holly Ridge, Louisiana. The Collinston site appeared ideal for a nesting area. There was a low sloping bank along the pond, small points of land jutting into the pond, and an island with cover. To date thirty-two birds have been released at Collinston. There have been no nesting attempts observed and at this time only nine adult birds remain there, 5 hens and 4 drakes. A survey of the area indicates a high population of raccoon, o'possum, and skunk in the vicinity. This is normal for this area as it borders a hardwood bottom. It would not be too premature to conclude now that predators are preventing nesting.

The Holly Ridge release shows promise of becoming a good established colony of mottled ducks. In April, 1964 a total of 42 birds were released; 7 mated pinioned pair, 12 class I and 23 class III or downy young. One large hatch of birds was seen and in December of 1965 seventeen adult birds were seen around the Bee Bayou area. This is the first natural hatch of mottled ducks in North Louisiana. In the early spring of 1966 a large release is planned in this area.

Experimental Teal Season

The early teal season has been discussed since August 1954 when it was proposed to the Missis-

Mississippi Flyway Council by Louisiana. On September 18, 1965 this season finally became a reality. It closed on September 26 and some of the findings from this season follows: A total of 41,550 special teal hunting permits were issued to Louisiana sportsmen by the Commission. The average hunter success was 2.2 teal per day per hunter. The regular duck season has an average kill success of 1.3 to 1.5 ducks per hunter per day. Therefore, it can be said that Louisiana had a successful teal season. Catahoula Lake had the highest average kill with 2.6 and Northwest Louisiana had the lowest success with .6 birds killed per day per hunter.

The U. S. Fish and Wildlife Service also conducted a wing survey and following is an excerpt of this report.

A preliminary examination of wing collection data from the 1965 teal season suggests that the ratio of blue-winged teal to green-winged teal in the kill was about 9 to 1. The greatest success per hunter occurred in the northern prairie states of North and South Dakota, Minnesota, Iowa, and Nebraska. The ratio of young adults was rather high in the north but low in the south. Sex ratios in the blue-winged teal kill showed that males were the first to move south.

Excerpt From Service Report

INTRODUCTION AND PROCEDURES

An experimental teal season was conducted in September, 1965 in the Central and Mississippi Flyways to determine whether the early migrating teal could provide additional hunting opportunity without depleting breeding populations. The Bureau of Sport Fisheries and Wildlife conducted several surveys to evaluate the results of this season. The duck wing collection survey was designed to measure the age and sex composition, distribution, and species composition of the teal kill. The following report is from a hand count of data obtained by the wing survey and is subject to some revision upon completion of machine tabulations. To accurately evaluate the results of the season requires that data from all surveys be utilized.

A sample of 800 packets of 10 envelopes each was sent to each participating state for distribution to permittees. While there was little basis for predicting response rates, it was felt that a sample of this magnitude would insure an adequate number of wings to determine the characteristics of the kill during the season. This sampling plan resulted in varying portions of the permittees per state being sampled in the wing survey.

AGE RATIOS

Immatures per adult of blue-winged teal killed was highest in the north and declined toward the

south in the Mississippi Flyway. The age ratio for blue-winged teal killed in the Mississippi Flyway was 2.3 immatures per adult. The age ratio of blue-winged teal in Louisiana was 1.1 immatures per adult. Ohio had the highest of 29 immatures per adult.

The green-winged teal sample was much too small to determine age ratios.

ADULT SEX RATIOS

Sex ratios revealed many characteristics of the population. Among them are the susceptibility of different age and sex groups to gunning pressure and the relative availability of each group.

Blue-winged Teal

Adult blue-winged teal killed in the Central Flyway generally had a sex ratio that favored females. However, in Nebraska and Texas, where larger samples were received, males outnumbered females by 1.3 and 9.4:1 respectively (table 4). The low age ratio of blue-wings in Texas (table 3) and the extremely unbalanced adult sex ratio suggest that an early migration of adult males had taken place and that other age and sex groups were less available in Texas. Largely because of the ratio in the Texas sample, the flyway weighted adult sex ratio favored males (1.35:1).

Only Minnesota, Illinois, and Missouri recorded adult sex ratios that favored females. Louisiana, which selected a late season (September 18-26), recorded an adult ratio of 2.5 males per female in contrast to the much more unbalanced ratio found in Texas (9.4:1) which selected an earlier season (September 4-12). This is further evidence that most of the early adult male migration had passed Louisiana before their season opened. The Mississippi Flyway weighted sex ratio of adult blue-wings was 1.00 male per female.

Green-winged Teal

As stated before the sample of green-winged teal collected was much too small to be used as a valid estimate, but the sample collected indicated an early migration of adult males. This is known to be true from other data.

Evaluation of Physical Changes in Marsh Pond of the Biloxi Development Projects

As the title of this job implies this job will show the beneficial or detrimental effects of earthen dams and weirs to the Biloxi Marsh. From all data gathered it is highly obvious that earthen dams and weirs have benefited the Biloxi Marsh.

This study was conducted only in the fall phase of October 1964. There was very little variance between October 1964 and October 1963 findings. All ponds sampled behind the weirs and earthen dams contained much more aquatic vege-

Table VI

**PRELIMINARY ESTIMATE OF THE DISTRIBUTION OF THE DUCK KILL DURING THE 1965 TEAL
SEASON AS DETERMINED BY RESPONSE RATES TO THE DUCK
WING COLLECTION SURVEY IN THE MISSISSIPPI FLYWAY**

<i>State</i>	<i>Total permits issued</i>	<i>Hunters contacted</i>	<i>Total wings received</i>	<i>Wings/ contact</i>	<i>Kill index</i>	<i>Percent of total kill distribution</i>
Minnesota	55,129	800	1,601	2.0	110,415	39.7
Michigan	7,306	750	546	0.7	5,322	1.9
Iowa	17,033	798	1,529	1.9	32,672	11.8
Illinois	9,069	800	1,113	1.4	21,619	4.5
Indiana	2,270	799	530	0.7	1,506	0.5
Ohio	2,295	799	681	0.9	1,957	0.7
Missouri	9,980	800	669	0.8	8,352	3.0
Kentucky	842	800	279	0.4	294	0.1
Arkansas	5,230	791	168	0.2	1,111	0.4
Louisiana	41,417	800	543	0.7	28,134	10.1
Mississippi	2,233	799	76	0.1	212	0.1
TOTALS	152,804	8,736	7,735	..	202,594	72.8

Table VII

**SPECIES COMPOSITION OF THE DUCK KILL DURING THE 1965 TEAL SEASON AS
DETERMINED BY DUCK WING COLLECTIONS IN THE MISSISSIPPI FLYWAY**

<i>State</i>	<i>Sample size</i>	<i>Blue-winged teal</i>	<i>Green-winged teal</i>	<i>Wood ducks</i>	<i>Misc. ducks</i>	<i>Totals</i>
Minnesota	1,601	93.6	5.7	0.6	0.0	99.9
Michigan	546	73.1	26.6	0.4	0.0	100.1
Iowa	1,529	89.0	9.9	0.9	0.2	100.0
Illinois	1,113	82.1	17.3	0.6	0.0	100.0
Indiana	530	80.2	14.7	4.5	0.6	100.0
Ohio	681	68.9	29.8	1.3	0.0	100.0
Missouri	669	90.6	7.5	1.6	0.4	100.1
Kentucky	279	85.7	4.3	10.0	0.0	100.0
Arkansas	168	85.1	7.1	7.7	0.0	99.9
Louisiana	543	96.5	3.3	0.0	0.2	100.0
Mississippi	76	88.2	1.3	10.5	0.0	100.0
Flyway weighted .....	....	91.5	7.7	0.7	0.1	100.0

tation than the control ponds. The Wisner tract was not evaluated.

The location and date of construction for each structure and earth dam erected on the Biloxi area was obtained from Robert Beter, Supervisor of District VIII. All weir locations and study ponds were the same as last year. More detailed maps of most study ponds and structures are attached to Project W-29R-7, Work Plan II, Job No. 10. The techniques used to investigate physical and vegetative changes in the study ponds were those described in the completion reports for Job No. 10, Work Plan II, of Project W-29R-7 and 8.

On October 14th, 15th and 16th samples were taken in the Biloxi Marsh ponds and the following table illustrates these findings.

	<i>Weir Pond</i>	<i>Earthen Dam Ponds</i>	<i>Control Ponds</i>
Ml. of vegetation per sample	22.4 ml.	44.7 ml.	5.1 ml
Turbidity	—25.0 ppm	—25.0 ppm	60.0 ppm
Salinities	3220 ppm	3856 ppm	4143 ppm

Vegetation in weir, earthen dams and control ponds on Biloxi Marsh, October 1964, expressed in ml. per sample.

	<i>Weir Ponds</i>	<i>Earthen Dam Ponds</i>	<i>Control Ponds</i>
<i>Ruppia maritima</i>	22.4 ml.	43.4 ml.	5.1 ml.
<i>Eleocharis</i> sp.	0	1.3 ml.	0

It is very evident from the above tables that the aquatic vegetation on the Biloxi weir and earthen dam ponds has increased markedly and that there is no question as to whether or not these weirs and earthen dams are beneficial to the Biloxi marsh tract.

Mississippi Flyway Council Activities

The Mississippi Flyway Council is composed of representatives of the three Canadian Provinces and the 14 states that make up this waterfowl management unit. The Council was formed to give game departments of the provinces and the various states a voice in directing the management of the waterfowl resource.

State representatives to the Council are administrators who are familiar with waterfowl problems. The Council is augmented by a Flyway Technical Committee which is comprised of waterfowl biologists from the various states and provinces of the Flyway.

The Technical Section meets twice each year.

A spring meeting which is held in various Flyway states is for the purpose of reviewing and coordinating research efforts. At this meeting, the previous hunting season, the past season inventories and the breeding ground outlook are discussed as are banding programs, habitat improvement, waterfowl diseases, land use changes and numerous waterfowl topics.

The summer meeting, held each August, is to discuss recently gathered production data and waterfowl populations. From a review of current information this committee recommends to the Flyway Council waterfowl season frameworks and bag limits for the coming year. The Council in turn recommends to the Bureau of Sport Fisheries and Wildlife.

It is through Louisiana's participation in Flyway Council and Technical Committees activities that several important permissive regulations have been advanced in recent years.

Richard Yancey, Assistant Director, represents Louisiana on the Council while the Waterfowl Study Leader serves on the Mississippi Flyway Technical Committee.

EXOTIC BIRD STUDY

RAYMOND J. PALERMO
Study Leader

The exotic bird study emerged in 1964 as the need arose for a continued thorough follow-up study on the various exotic bird releases the Commission is working with. Little is known about most of these exotics and all the knowledge that can be gained through a sound research program of this type will be invaluable in planning and executing exotic bird releases in the future. The success or failure of a particular species could well be dependent upon prior research.

The U. S. Fish and Wildlife Service began a



Black francolin nest and eggs at the Gum Cove release area. Another nest with five eggs was found approximately forty yards from this one. Eggs may vary in color from brown to bluish.



Immature male black francolin wild-trapped at Gum Cove. Notice the typical male white ear-patch developing.

study on foreign game likely to prosper in specific regions of this country. From this study several birds have been suggested for trial in Louisiana. Dr. Gardner Bump, who heads this project for the Fish and Wildlife Service, has been enthusiastic about the similarity of the conditions in Louisiana with the native habitats of some of the species recommended for trial release here.

Black Francolin

GUM COVE RELEASE

The black francolin is one species which is highly recommended for trial release in Louisiana. The Gum Cove francolin release was begun in 1961 when 110 adult live trapped birds from India were released. In 1962 an additional 201 were released bringing the total to 311 with a sex ratio of 170 males and 141 females.

During the past two years Commission personnel have made numerous checks on the release area. A number of broods has been observed each summer since these birds have been released. During the spring and summer many males and some females have been observed.

A graduate student spent a great deal of time at the Gum Cove area during the winter of 1964-65 and the summer of 1965 studying this exotic bird. In his studies, which included the development of trapping techniques, he caught 29 black francolins during the winter. Only one of these wore a leg band—a female released there in 1961. This in itself showed that she was at least 5 years old. This trapping program also indicated that the overwhelming majority of birds present at Gum Cove are locally reared birds. A summer trapping project was carried out in 1965 result-

ing in the catch of 43 francolins. Many of these were juvenile birds. Several active nests were located and the progress of each was followed. Much was learned of the breeding habits of the black francolin in the wild. Marking studies were initiated in efforts to gain knowledge on the movements of these birds. The most important aspect of these studies was the development of a suitable trapping technique, because most future research on this bird will be dependent upon successful trapping.

Observation reports show that the black francolin has spread as far north as Hwy. 90 in Calcasieu Parish in the vicinity of Vinton, Edgerly, and Sulphur.

The 1965 breeding season was very favorable and the overall picture looks bright at this time. Undoubtably the black francolin population at the Gum Cove release area is higher than it has ever been. There are many acres of Louisiana real estate that could apparently support a good francolin population.

OAK RIDGE RELEASE

Wild trapped black francolins were also released near Oak Ridge in Morehouse Parish in 1961 and 1962. A total 342 wild trapped birds were released: 152 in 1961 and 190 in 1962. The birds at Oak Ridge seemed to have gotten off to a good start when first released but according to the many field trips made in and around the release area the population began to decline. Call count routes were set up and run frequently during the breeding season. These call counts indicate that the breeding population is declining each year. Francolin observations also have been declining the past two years. All the reasons for these birds not holding on are not known but we feel that the accelerated clean cultivation that has taken place in and around the release area had much to do with the declining population.

BODCAU G.M.A. AND FORT POLK G.M.A. RELEASES

Due to the Commission not being able to obtain wild-trapped francolin from India anymore, an exotic propagating unit was set up at DeRidder, Louisiana. This unit's function is to produce recommended exotic birds for release in selected areas.

One of these areas is the Bodcau Game Management Area near Minden, Louisiana. In 1965 a total of 270 pen-reared black francolins were placed in a large wire conditioning pen on the area. Some of these have been released and the remainder will be released in early spring. Their progress will be watched closely in order that we may properly evaluate the release of pen-reared black francolins in this area.

On the Fort Polk Game Management Area near Leesville, Louisiana, a total of 161 pen-reared

francolins was placed in an identical conditioning pen built at the selected release site. Some of these have already been released and the remainder will be released in early 1966. This release is aimed at determining whether pen-reared black francolins can survive and become established in the longleaf pine type.

Both the Bodcau and Fort Polk releases are scheduled for three consecutive years and the main objective is to test the timber types and the northern range limit in the case of Bodcau.

Red Junglefowl

THISTLETHWAITE RELEASE

The red junglefowl is another exotic bird recommended for trial release in Louisiana. The junglefowl is a native of Southeast Asia. This exotic is being produced at the DeRidder unit and some were released on four selected areas in 1964 and 1965.

One of these is the Thistlethwaite Game Management Area located near Opelousas, Louisiana. In 1964, 61 pen-reared junglefowl were placed in a conditioning pen constructed at the release site. A partial release of these birds was made in the fall of 1964 and a final release made in early spring 1965. During the 1965 breeding season 61 junglefowl were put in the conditioning pen for release in the fall and spring. Our release method is termed the "gentle release". After the birds have settled down and become accustomed to the noises and vegetation of the release area a portion is released in the fall simply by opening the gate. In early spring, the remainder is similarly released. The reason for holding birds until spring is assurance of having birds on the area when the breeding season arrives. This release program is tentatively set up for three consecutive years. If an area shows promise then additional releases will be planned. To date the Thistlethwaite release indicated that some birds survived but no reproduction was in evidence. Dispersal was up to 10 miles of the release site.

ST. HELENA RELEASE

Another junglefowl release area is located in St. Helena Parish near Kentwood, Louisiana. This area is in the pine timber type. In 1964, 30 junglefowl were placed in a conditioning pen at the release site. In 1965, 50 junglefowl were put in the conditioning pen for release in the fall of 1965 and spring of 1966.

The St. Helena release has shown much promise. All through the summer of 1965 birds could be heard and seen in and around the release site. Dispersal upon release was a minimum. A number of broods of young was reported by Commission personnel. This area will be closely watched in 1966 as it shows the most promise toward the establishment of red junglefowl.

IDLEWILD RELEASE

The third junglefowl release location is on the Idlewild Research Area near Clinton, Louisiana. This too is in a pine timber type. Fifty birds were placed in the pen here in 1964 and 41 in 1965. The same "gentle release" method was employed here as in all our exotic bird releases.

This release also looks good up to the present time. A number of broods was reported here by an L.S.U. graduate student who was making a study of the red junglefowl releases in Louisiana. Much was learned from his studies and it will be used in selecting and making additional releases in the future. Dispersal on this area extended to about 3 miles.

WEST BAY RELEASE

The fourth junglefowl release area is the West Bay Game Management Area located in Allen Parish near Oakdale, Louisiana. This large wooded section is composed of both the pine type and the bay type hardwoods. Seventy-six birds were placed here in 1964 and 51 in 1965. Releases were on the same order as in other areas. Junglefowl from these releases dispersed several miles from the conditioning pen on this area, although a few remained in the release vicinity. No broods were reported on this area during the summer of 1965.

It is indeed too early to come up with definite conclusions on the future of red junglefowl on the four release areas. After the two more years of planned releases we certainly will be in a much better position to properly evaluate the releases that will have been made.

Pheasants

FENTON RELEASE (JAPANESE GREEN PHEASANT)

One species of pheasant the Commission is working with is the Japanese green pheasant. This pheasant is about the size of the ringneck and a native of Japan. The exotic game bird propagating unit at DeRidder is successfully rearing this species for releasing on a trial basis. We are presently using one release area because of the large number of birds recommended for releases. With pheasants, as with other exotics, we employ the "gentle release" method. This release is also scheduled for three consecutive years after which an evaluation will be made and a future course planned.

The Japanese green pheasant release area was selected in the "rice belt" near Fenton, Louisiana. This section offers fairly good cover and food supply. In 1964, 99 birds were put in the conditioning pen and released. No broods were reported the summer of 1965 although pheasants were heard and seen all along. In the summer of 1965 a total of 136 were put in the pen and

scheduled for release in the fall of 1965 and spring of 1966. We experienced heavy mortality on these birds due to disease. The remaining survivors were released.

MELVILLE RELEASE (WESTERN IRANIAN PHEASANT)

The other species of pheasant the Commission is experimenting with is the Blackneck Pheasant from Iran. This pheasant is also about the size of the ringneck. One important factor is the low egg production of the blackneck in captivity. This requires a large number of breeders to produce a suitable number of birds for release. The Commission began with a few blacknecks and could not rear enough birds for release with the facilities and labor at hand. As a result we therefore had to suspend the blackneck production at the DeRidder unit until we can obtain suitable facilities and adequate labor.

As we suspended blackneck pheasant production in 1965, the birds on hand consisting of 53 birds were released on a trial basis in St. Landry parish near Melville, Louisiana. These birds were also "gentle released." A close watch on these birds will be kept and all that is learned will be put to use when we resume blackneck pheasant releases in the future.

Bamboo Partridge

DeRIDDER RELEASE

The bamboo partridge is an exotic game bird originally from South China but has been successfully introduced into Japan. The bamboo partridge may be described as somewhat similar to the bobwhite quail in plumage although in the bamboo both sexes are identically colored. The only way to distinguish male from female is by the quite long sharp spurs of the male. Compared to a bobwhite in size the bamboo partridge is about one and one-half times as large. Being multi-brooded, it has a high reproductive potential.

The Commission's propagating unit at DeRidder is presently rearing this species for release on a selected area. This release area is located near DeRidder in Beauregard parish. A conditioning pen was constructed at the release site and 64 birds were placed in it for release in early Spring, 1966. This release is also scheduled for 3 years. If the bamboo partridge shows promise on this area, then the program will be expanded and intensely studied.

BLACK BEAR RESTOCKING

LOUIS BRUNETT Study Leader

The black bear that once ranged over all of Louisiana has about disappeared from most of his

former haunts. Native bear ranges have shrunk to the extent that only northeast Louisiana and an area of the lower Atchafalaya were known to contain bears. An occasional straggler has been reported from other parts of the state. Habitat destruction and persecution by man are the two factors responsible for the present status of the bear in Louisiana.

The Wild Life and Fisheries Commission realizes that little can be done to renew bear habitat, but feels that there is possibly a place for man and bear to co-exist on some of the remaining woodland areas of the state. In order to investigate this possibility a bear restocking program was begun in 1964. A source of wild black bears was found when the State of Minnesota offered bears if Louisiana personnel would trap and haul them. These bears are of the same species native to Louisiana and are prized by hunters as a big game trophy animal.

Fifteen traps were made, each from two 55 gallon metal drums. The traps were constructed by removing both ends from the barrels and welding two together. After the two barrels were connected a drop type, trigger operated, trap door was attached to one end. On the end opposite the trap door, a door of expanded metal, sliding in a metal channel, was attached. The expanded metal door was provided for the removal of the bear. A hauling crate, constructed from expanded metal and angle iron, was built on the bed of a two ton truck. This hauling crate can be removed intact when not in use.

In August of 1964 a trapping crew of four men, the 15 traps, and truck with hauling body were dispatched to Minnesota to trap bear. A total of 28 bear were brought to Louisiana and released in the Atchafalaya River Swamp near Krotz Springs. The release consisted of seventeen males, three females, and seven cubs which were not sexed.

Numerous reports of bear being seen and damage complaints throughout the State were received and these were investigated. The presence of bear being in some of these areas was verified by tracks. Numerous reports were received that on investigation proved false. The people making the reports of bear tracks did not know bear sign.

Reports of bears being killed by automobiles or shot were investigated. Some bear showing up around peoples houses, especially in town, were caught and returned to the original release site. Some of these bear were caught with ropes and tied, some were caught with ropes and put in a hauling crate, and some were caught by use of a tranquilizer administered by a specially designed syringe fired through a CO₂ rifle.

Since the first 28 bear were released 14 animals have been verified as being killed. Twelve of these were ear tagged. One of those not tagged was killed in an area where there are a few native



A trapped bear being carried to a pick-up truck. Once on the pick-up, it will be transported to the centrally located truck with hauling crate.

bear. Of those killed eleven were shot and three were killed by automobiles. Twelve bear were caught and taken back to the original release point.

Of all the bear reported killed or caught and taken back to the original release point all but one was a male. This indicates that the adult males may travel more than the females or cubs.

In the spring of 1965 the Commission asked the State of Minnesota for another permit to trap bear. The request for this permit asked that only females with cubs be moved to Louisiana. Permits



A few of the bear were released directly into the swamps.

were received to trap and move a total of 50 females and cubs. However, during the trapping operation permission was obtained to move a few more.

During the summer of 1965 a total of 55 bear were trapped in Minnesota and moved into Louisiana. Forty-six of these were released in the Atchafalaya River bottom in the same area as those of 1964. Nine were released on the Madison-Tensas Parish line on the Chicago-Mills Game Management Area. Of the bear released in 1965, 12 were adult females, 6 were males—one and one-half years old, and the others were cubs.

Of the bear released in 1965, one has been reported killed. This was a cub and it was run over by an automobile on U.S. Highway 190 near the Atchafalaya River bottom release site. Commission personnel working on the Chicago Mills Area have reported seeing bear.

It is believed that releasing females with cubs may be the way to get the black bear re-established in suitable habitat in the State.

Many people believe the bear to be a dangerous animal. If a bear is left unmolested it is not dangerous. They are like many other wild animals. They want to stay out of the way of people. However, it is dangerous to molest the cubs of a female or to shoot a bear and wound it. But if they are left alone they will leave people alone.

RESEARCH DESIGN, MACHINE COMPILATION AND ANALYSIS OF DATA

Federal Aid Project FW-2R

HERBERT STERN, JR.
Project Leader

Introduction

Since July, 1959 when Project FW-2R was initiated, its basic responsibilities in the field of research design and data processing have remained unchanged.

Generally, three types of programs are handled by the project in respect to supervisory control: (1) wildlife surveys, (2) coordinated programs and (3) service programs. Wildlife surveys can be of area interest or statewide in scope. In the period of this biennium, survey commitments have greatly increased and represent the major role of the Project by time analysis. The Project handles one coordinated program—that of bird banding. In this coordination, the administration of the program is handled with the U. S. Fish and Wildlife Service and Louisiana field biologists; collection forms and data processing systems are developed and operated; and certain reports produced. Service programs are operated for research biologists in the fish and game areas. Project responsibilities for these programs include field col-

lection forms and data processing. Report generations are prescribed by the biologist for whom the service is being rendered.

At the close of 1965 the Project operated with six permanent employees and with basic data processing machinery including a Univac 1004 computer which was installed in October, 1965.

The following sections will summarize work accomplishments for Project FW-2R during 1964 and 1965.

Surveys

STATEWIDE DEER KILL

Beginning with the 1963-64 hunting season, deer hunters were surveyed by mailed questionnaires to obtain estimates of kill over the state. This means of estimating replaced the "voluntary" reporting method of the 1960 through 1962 seasons.

Design.

The survey encompassed a sample size drawn at random from hunters who were issued big game licenses. For the 1963-64 survey, the sample was 10 percent and was drawn over the state. For the 1964-65 survey, the sample was drawn by sampling districts in proportion to the number of licenses issued.

Duplicate receipts of licenses issued were returned by mail from the issuers to the Project office. The sample was taken from the duplicate receipts (called notices of purchase) by ten two-digit numbers picked at random and representing the final two digits of the big game license number. Licensed hunters, those who paid \$2 for their license, were sampled separately from permit hunters—those persons under 16 or over 60 years of age who were issued free licenses.

Originally, a cut-off date of January 1 was decided upon for the state-wide survey. All receipts in our possession by that date would be used. It was postulated that persons buying licenses after this date would be hunting little and probably with a lower success rate than hunters who had purchased licenses in the early part of the season. To determine the hunting characteristics of the people who bought late licenses and to determine if we were receiving all duplicate receipts, it was decided to audit a sample of 16 Parish records at Sheriffs' offices. The selection of Parishes to sample was determined with probability in proportion to the number of licenses outstanding on January 1. This sampling became of critical importance since only about one-half of the licenses issued to Sheriffs had been returned and reported sold by January 1. For the 1963-64 survey, audits showed that approximately three-fourths of the licenses not being reported by January 1 had been sold and the receipts were not mailed to the Project office.

To arrive at total estimates, then, two separate surveys were carried on: The state-wide survey, a sample over the state from those license receipts returned to the Project office prior to January 1 and the Parish survey, a sample from 16 (out of 64 total parishes) Parishes to estimate activity of hunters whose license receipts had not reached us by January 1.

Three mailings of the questionnaires at approximately 1 month intervals were scheduled. An address deck of punched cards was made up and respondents from each mailing were purged before subsequent mailings. Address labels were prepared by computer using the machine card deck. Responses to questionnaires were punched into detail machine cards and these cards summarized for computer input in extrapolation of total estimate.

Results.

Statewide estimates for the 1963-64 and 1964-65 hunting seasons are given in Table 1.

Table 1.
STATEWIDE ESTIMATES FOR DEER KILL SURVEY, 1963-64 AND 1964-65 HUNTING SEASONS

Items of Interest	Estimates	
	1963-64	1964-65
Number of hunters	86,500	99,800
Days hunted	640,000	780,400
Total deer killed	24,100	23,100
% Buck.....	87.9	93.8
% Doe.....	12.1	6.2

GAME MANAGEMENT AREA—HUNTER USE SURVEY

The Commission has for several years operated game management areas for hunting either on a season or daily permit basis. Daily permit hunting has been required on all controlled short-term deer hunting and total hunting efforts and success data are collected. Hunting by season permits have been allowed on certain of these game management areas for various species of resident game as well as dove and waterfowl for a relatively long duration period and no attempt has been made to estimate use of the areas for this hunting. Objectives of the survey were to estimate total use of these game management areas by season permit hunters and to estimate pressure and success for each species of game over all areas.

Design

Season permits are issued from the Commission's eight district offices and the holder of a permit is eligible to hunt any area for specified species and during established hunting seasons. A five percent sample of hunters who received permits from each district office was used for the survey.

Detail design follows the deer kill survey and normal routines for a mail survey. Three mailings were executed with responses purged for subsequent mailings.

Results

The survey showed that an estimated 13,000 hunters took advantage of season permit hunting on the 16 areas. Breakdowns for the various species and game management area estimates are given in Tables 2 through 8.

Table 2.
ESTIMATED TOTAL NUMBER OF HUNTERS FOR EACH AREA, GAME MANAGEMENT AREA SURVEY

G.M.A.	Estimate	95% Confidence Limits	80% Confidence Limits
Alexander State Forest ..	800	470-1,130	590-1,010
Bodeau	2,800	2,320-3,280	2,490-3,110
Caldwell	170	50- 290	90- 250
Catahoula	1,000	700-1,300	810-1,190
Chicago Mills	2,600	1,900-3,300	2,150-3,050
Concordia	500	360- 640	410- 590
East Carroll	270	100- 440	160- 380
Evangeline	440	180- 700	270- 610
Jackson-Bienville	1,100	840-1,360	930-1,270
Lutcher-Moore	270	60- 480	130- 410
Red Dirt	570	350- 790	430- 710
Russell-Sage	1,700	1,150-2,250	1,350-2,050
Sabine	300	40- 560	130- 470
Soda Lake	70	1- 139	20- 120
Union	440	200- 680	280- 600
West Bay	2,100	1,560-2,640	1,750-2,450

Table 3.
ESTIMATES FOR ARCHERY HUNTS FOR DEER, GAME MANAGEMENT AREA SURVEY

G.M.A.	No. of Hunters	Days Hunted	Kill
Alexander State Forest	(3.9)*	(1.9)*	(0.0)*
Bodeau	(7.6)	(6.2)	(0.0)
Caldwell	(1.6)	(1.3)	(0.0)
Catahoula	(3.7)	(2.3)	(15.3)
Chicago Mills ...	(29.2)	(33.5)	(64.5)
East Carroll	(0.3)	(0.2)	(0.0)
Evangeline	(1.7)	(0.7)	(0.0)
Jackson-Bienville	(15.5)	(13.1)	(14.9)
Red Dirt	(6.0)	(7.3)	(0.0)
Russell-Sage	(3.1)	(2.7)	(0.0)
Sabine	(0.5)	(0.6)	(0.0)
Union	(2.8)	(2.5)	(5.2)
West Bay	(24.2)	(27.8)	(0.0)
Total Estimate ..	3,500	13,600	250
95% Confidence Limits	2,870-4,130	10,800-16,400	50-450
80% Confidence Limits	3,100-3,900	11,800-15,400	120-380

*Percent of total estimate.

Table 4.
ESTIMATES FOR GUN HUNTS FOR DEER, GAME MANAGEMENT AREA SURVEY

G.M.A.	No. of Hunters	Days Hunted	Kill
Bodeau	(56.2)*	(79.7)*	(84.9)*
Russell-Sage (Except Nov. 27) ..	(43.8)	(20.3)*	(15.1)
Total Estimates .	2,700	8,300	120
95% Confidence Limits	1,720-3,680	6,100-10,500	**
80% Confidence Limits	2,070-3,330	6,900- 9,700	**

*Percent of total estimate.
**Confidence Limits over 100%.

Table 5.

ESTIMATES FOR SQUIRRELS, GAME MANAGEMENT AREA SURVEY

G.M.A.	No. of Hunters	Days Hunted	Kill
Alexander State Forest	(6.2) *	(3.7) *	(5.6) *
Bodcau	(16.1)	(16.2)	(12.6)
Caldwell	(1.3)	(0.6)	(0.5)
Catahoula	(8.7)	(9.2)	(6.8)
Chicago Mills ...	(17.2)	(18.3)	(18.0)
Concordia	(4.5)	(4.8)	(5.5)
East Carroll	(2.3)	(1.7)	(3.1)
Evangeline	(3.5)	(3.9)	(2.6)
Jackson-Bienville	(6.2)	(5.9)	(8.1)
Lutcher-Moore ..	(1.1)	(1.8)	(1.7)
Red Dirt	(2.1)	(1.8)	(2.9)
Russell-Sage	(10.5)	(10.8)	(5.7)
Sabine	(2.5)	(4.0)	(6.9)
Union	(3.0)	(5.3)	(5.4)
West Bay	(14.7)	(12.2)	(14.6)
Total Estimates .	11,100	42,600	97,200
95% Confidence Limits	9,800- 12,400	34,700- 50,500	77,900- 116,500
80% Confidence Limits	10,300- 11,900	37,500- 47,700	84,800- 109,600

*Percent of total estimates.

Table 6.

ESTIMATES FOR WATERFOWL, GAME MANAGEMENT AREA SURVEY

G.M.A.	No. of Hunters	Days Hunted	Kill
Bodcau	(76.6) *	(70.2) *	(73.0) *
Russell-Sage	(19.0)	(27.9)	(25.8)
Soda Lake	(4.3)	(1.9)	(1.2)
Total Estimates .	1,600	9,900	8,400
95% Confidence Limits	1,100- 2,100	4,500- 15,300	3,000- 13,800
80% Confidence Limits	1,280- 1,920	6,500- 13,300	4,900- 11,900

*Percent of total estimate.

Table 7.

ESTIMATES FOR QUAIL, GAME MANAGEMENT AREA SURVEY

G.M.A.	No. of Hunters	Days Hunted	Kill
Bodcau	(39.0) *	(19.3) *	(7.7) *
Lutcher-Moore ..	(22.9)	(45.5)	(45.8)
Red Dirt	(22.3)	(20.0)	(39.4)
West Bay	(15.8)	(15.1)	(7.0)
Total Estimates .	700	2,800	4,100
95% Confidence Limits	370- 1,030	700- 4,900	1,600- 6,600
80% Confidence Limits	490- 910	1,400- 4,200	2,500- 5,700

*Percent of total estimate.

Table 8.

ESTIMATE FOR DOVE, GAME MANAGEMENT AREA SURVEY

G.M.A.	No. of Hunters	Days Hunted	Kill
Bodcau	260	800	2,200
95% Confidence Limits	70-450	90-1,510	100-4,300
80% Confidence Limits	140-380	340-1,260	900-3,500

BILOXI W.M.A. FISHERMEN USE SURVEY

The Biloxi Wildlife Management Area, located in St. Bernard Parish and adjacent to Lake Borgne is managed primarily for waterfowl. In addition, a large number of fishermen also utilize the area and surrounding waters. To measure this fishermen use, a short-termed survey was conducted during the summer of 1964.

Design

Because the area is honeycombed with waterways, the best approach for sampling was two major access points: one, the Shell Beach area and two, the Hopedale area. There are several boat liveries at each town and are utilized by fishermen in proportion to their size and reputation. It was determined that most sport fishermen who fish the Biloxi and surrounding area use the commercial docks at Shell Beach and Hopedale as ingress and egress points.

The sampling scheme involved checking three sampling docks at Shell Beach and four at Hopedale. These docks were sampled in proportion to probability of use. Days of the week were stratified to include:

Stratum I, Monday through Friday

Stratum II, Saturday and Sunday.

Each day of the week was divided into four time periods beginning at 4 AM and ending at 8 PM. Therefore, there are 20 time periods in Stratum I and eight in Stratum II. A random selection of twelve time periods were selected each week in Stratum I and each of the time periods were sampled in Stratum II.

Sampling was scheduled on a weekly basis and, as planned, utilized a 40 hour week for four persons.

Results

The survey showed that during the period sampled, June 29-September 27, the majority of the fishermen utilized the waters outside the managed area. For the sampling period as estimated 17,550 fishermen fished 115,100 hours. There were an estimated 196,200 fish caught which weighed an estimated 195,900 pounds. Table 9 gives a weekly breakdown for number of fishermen and hours fished while Table 10 shows the total number and pounds caught for each species of fish.

Table 9.

**ESTIMATED NUMBER OF FISHERMEN AND HOURS FISHED BY FISHERMEN WHO FISHED
THE BILOXI W.M.A. AND THE SURROUNDING AREA FOR EACH WEEK**

Week	ESTIMATED NO. FISHERMEN			ESTIMATED HOURS FISHED		
	<i>Biloxi Area</i>	<i>Surrounding Area</i>	<i>Total</i>	<i>Biloxi Area</i>	<i>Surrounding Area</i>	<i>Total</i>
1	229	1,753	1,982	1,883	10,954	12,837
2	40	2,534	2,574	282	17,331	17,613
3	139	1,340	1,479	957	8,490	9,447
4	32	2,154	2,186	246	13,988	14,234
5	50	1,492	1,542	352	8,289	8,641
6	39	1,223	1,262	264	8,407	8,671
7	33	1,736	1,769	91	12,468	12,559
8	35	1,772	1,807	242	11,016	11,258
9	27	1,549	1,576	174	12,453	12,627
10	15	1,358	1,373	105	7,098	7,203
TOTAL	639	16,911	17,550	4,596	110,494	115,090

Table 10.

**TOTAL ESTIMATED NUMBER AND POUNDS OF FISH CAUGHT DURING THE 10 WEEK SURVEY
FOR THE BILOXI AREA FISHERMEN USE SURVEY**

SPECIES	ESTIMATED NUMBER CAUGHT			ESTIMATED POUNDS CAUGHT		
	<i>Biloxi Area</i>	<i>Surrounding Area</i>	<i>Total</i>	<i>Biloxi Area</i>	<i>Surrounding Area</i>	<i>Total</i>
Sport crabbing .....	*	*	*	....	5,661	5,661
Sport shrimping .....	*	*	*	....	2,656	2,656
Bull Shark .....	....	64	64	....	552	552
Hammerhead .....	....	6	6	....	30	30
Spotted gar .....	....	3	3	....	87	87
Ladyfish .....	....	9	9	....	7	7
Lizzardfish .....	....	3	3	....	2	2
Gafftopsail catfish	23	450	473	56	917	973
Sea catfish .....	....	47	47	....	64	64
Grouper .....	....	36	36	....	90	90
Red snapper .....	....	140	140	....	269	269
Largemouth bass .....	....	4	4	....	3	3
Bluefish .....	....	113	113	....	225	225
Cobia .....	....	42	42	....	621	621
Amberjack .....	....	4	4	....	46	46
Crevalle jack .....	....	9	9	....	218	218
Pompano .....	....	6	6	....	5	5
Silver perch .....	....	7	7	....	2	2
Sand seatrout	408	49,973	50,381	606	41,235	41,841
Spotted seatrout	4,641	74,009	78,650	4,317	85,848	90,165
Spot .....	....	349	349	....	227	227
Southern kingfish	33	3,139	3,172	60	2,620	2,680
Croaker	1,228	50,828	52,056	633	24,069	24,702
Black drum	40	918	958	172	2,872	3,044
Red drum	334	5,157	5,491	1,079	13,372	14,451
Sheepshead	37	340	377	140	793	933
Pinfish .....	....	10	10	....	4	4
Atlantic spadefish .....	....	10	10	....	20	20
Hogfish .....	....	5	5	....	3	3
Cutlassfish .....	....	10	10	....	7	7
Spanish mackerel .....	....	143	143	....	423	423
Flounder	200	3,416	3,616	297	5,543	5,840
TOTALS	6,944	189,250	196,194	7,360	188,491	195,851

*Numbers not recorded.

DOVE HARVEST SURVEY

A dove harvest survey using telephone subscribers as the sampling frame has been conducted for two years. This is a joint undertaking of Projects FW-2R and W-29R and the report is found elsewhere in this Biennial.

Banding Program

The bird banding program by the Louisiana Wild Life and Fisheries Commission is coordinated through Project FW-2R. Project functions in this area include collection of banding data from field biologists; design and updating of a processing system; publishing periodic reports of

banding activities of the Commission; and the administration of the system under guidelines set forth by the U. S. Fish and Wildlife Service.

During the biennium all backlog commitments were finalized including integration of a complete deck of punched cards of all banding data of Louisiana since 1927. All current banding and retrap data from Commission sources were processed and all recovery records forwarded from the U. S. Fish and Wildlife Service were punched into machine cards.

Summary records of banding, retrap and recovery data handled during 1964 and 1965 are presented in Tables 11 through 16 of this report.

Table 11.

NUMBER OF BIRDS BANDED BY LOUISIANA WILD LIFE AND FISHERIES COMMISSION PERSONNEL DURING 1964

SPECIES	AGE				Total Banded
	Adult	Imm.*	Local**	Not-Aged	
Horned grebe .....	....	....	....	1	1
Mallard	4	....	....	1	5
Mottled duck	12	25	....	1	38
Gadwall .....	....	3	....	....	3
Blue-winged teal	84	65	....	....	149
Shoveller	16	13	....	....	29
Pintail	23	7	....	3	33
Wood duck	42	27	29	1	99
Lesser Scaup	1,535	1,193	....	382	3,110
Ring-necked duck	3	2	....	....	5
Lesser snow goose	3	9	....	....	12
Blue goose	12	21	....	2	35
Canada goose .....	....	19	....	....	19
Fulvous tree duck .....	....	4	....	....	4
King rail .....	....	....	....	2	2
Clapper rail .....	....	....	....	3	3
American coot .....	....	....	....	1	1
American woodcock	15	....	....	44	59
Mourning dove	245	155	....	2	402
TOTAL	1,994	1,543	29	443	4,009

*Imm.=immature.

**Local=nestling.

Table 12.

NUMBER OF BIRDS BANDED BY LOUISIANA WILD LIFE AND FISHERIES COMMISSION PERSONNEL DURING 1965

SPECIES	AGE				Total Banded
	Adult	Imm.*	Local**	Not-Aged	
Pied-billed grebe .....	....	....	....	7	7
Mallard	12	....	....	4	16
Mottled duck	13	306	....	....	319
Green-winged teal	2	1	....	....	3
Blue-winged teal	252	398	....	2	652
Shoveller	2	1	....	....	3
Pintail	31	5	....	1	37
Wood duck	6	25	1	....	32
Lesser scaup	29	96	....	1	126
Ring-necked duck	15	....	....	1	16
Blue goose	10	18	....	1	29
Canada goose	1	19	....	....	20
Fulvous tree duck	2	33	....	....	35
American coot	1	1	....	774	776
Snipe .....	....	....	....	31	31
Mourning dove	463	333	4	3	803
TOTAL	839	1,236	5	825	2,905

*Imm.=immature.

**Local=nestling.

Table 13.

**NUMBER OF BIRDS RETRAPPED AT BANDING
STATIONS OPERATED BY LOUISIANA
WILD LIFE AND FISHERIES COMMISSION
DURING 1964 AND 1965**

Species	No. of Retraps	
	1964	1965
Mallard		1
Mottled duck		1
Blue-winged teal	6	18
Shoveller	1	...
Pintail	1	...
Wood duck	61	...
Lesser scaup	501	7
Lesser snow goose	1	...
Blue goose	2	1
American coot		4
Mourning dove	163	339
TOTALS	736	371

Table 14.

**RECOVERIES OF BIRDS BANDED BY LOUISIANA
WILD LIFE AND FISHERIES COMMISSION
PERSONNEL FROM RECORDS RECEIVED
DURING 1964 AND 1965**

Species	No. Rec. In Louisiana	No. Rec. Outside Louisiana	Total Number Recovered
Mallard	8	31	39
Mottled duck	3	..	3
Blue-winged teal ..	2	1	3
Pintail	..	2	2
Wood duck	43	19	62
Lesser scaup	21	73	94
Lesser snow goose..	1	..	1
American coot.....	1	..	1
Woodcock	2	1	3
Mourning dove ...	74	21	95
TOTALS	155	148	303

Table 15.

**RECOVERIES OF BIRDS BANDED IN LOUISIANA
BY OTHER THAN LOUISIANA WILD LIFE AND
FISHERIES COMMISSION PERSONNEL FROM
RECORDS RECEIVED DURING 1964 AND 1965**

Species	No. Rec. In Louisiana	No. Rec. Outside Louisiana	Total Number Recovered
Mallard	8	22	30
Mottled duck	1	1	2
Gadwall	..	1	1
American widgeon..	2	1	3
Blue-winged teal ..	2	3	5
Pintail	3	..	3
Wood duck	2	8	10
Lesser scaup	26	25	51
Ring-necked duck ..	38	38	76
Canada goose	37	75	112
Trumpeter swan ..	1	..	1
Clapper rail	1	..	1
American coot	1	1	2
American woodcock	12	34	46
Ground dove	4	..	4
Mourning dove ...	1	2	3
TOTAL	139	211	350

Table 16.

**RECOVERIES OF BIRDS BANDED OUTSIDE
LOUISIANA AND KILLED IN LOUISIANA FROM
RECORDS RECEIVED DURING 1964 AND 1965**

Species	Number Recovered
Mallard	812
Black duck	11
Mottled duck	6
Gadwall	52
American widgeon	43
Green-winged teal	41
Blue-winged teal	190
Unidentified teal	2
Cinnamon teal	1
Shoveller	21
Pintail	190
Wood duck	689
Redhead	6
Canvasback	10
Greater scaup	1
Unidentified scaup	2
Lesser scaup	260
Ring-necked duck	33
Hybrid duck	1
White-winged scoter	1
Lesser snow goose	38
Blue goose	89
White-fronted goose	33
Canada goose	15
Hutchins' or Richardson's goose	2
American coot	33
American woodcock	1
Mourning dove	24
White-winged dove	1
TOTAL	2,608

Service Programs

In the area of service programs, Project FW-2R provides data processing for various fish and game studies. Data collecting forms and punch card formats are developed; collected statistics are audited, coded and punched into machine cards; and results the programmed into various tabulated print-outs as requested by the individual biologist concerned.

During the biennium, service programs were carried out for game management area deer kills (Project W-29R), creel census (Project F-7R), fish population studies (Project F-8R), alligator tagging (Refuge Division) and water quality analysis (Division of Water Pollution Control).

Outdoor Recreation

In 1965 work was begun on a cooperative program with the Parks and Recreation Commission to process data collected for the outdoor recreation program as set forth under the Land and Water Conservation Fund Act. In addition, the Project Leader is to act as coordinator and advisor for the various survey programs to be initiated under this program: such as, private and public use sectors; user attitudes; and economic values. Results from wildlife surveys are to be made available for generalized outdoor recreation use

in respect to content and stratification breakdowns.

During the period covered by this biennium, program design and data processing were carried out in the area of the private sector inventory from data collected by Soil Conservation Service personnel. In addition, considerable planning and preparatory design work began in the area of frame development and survey needs.

Research Programs

In survey programs carried out and programs anticipated in the future, a major problem area is the development of adequate sampling frames, that is, a list of names from which to draw a sample.

During previous surveys in which hunters or fishermen were to be contacted, lists of names from big game license holders, season permit holders and telephone subscribers have been used. Other surveys, notably in the area of fishermen creel estimates, have required on site sampling.

If we wish to contact all hunters and/or fishermen in the State, however, we run into the problem of identifying these people or we must specify restrictions if all persons cannot be identified: i.e. if we use basic hunting licenses we must say that the frame consists of hunters between the ages of 16 and 59 since persons under and over this age group are not required to purchase licenses. For fishermen, there is a further restriction: only those who use a reel or artificial bait and are between the ages of 16 and 59 need purchase a license.

Furthermore, because of administrative procedures in handling license sales and laws governing issuing agents, it is impossible to obtain a current list of license holders for survey purposes. It is necessary, then, to use the previous year's licenses when sampling from this source.

There are additional pitfalls restricting hunting and fishing license use which include incomplete names and address and illegible duplicate copies. There is also a problem arising in obtaining information about a particular parish. Licenses are sold and recorded by parish of sales, not by parish of residence of the licensee. Sampling from the license file dictates stratification by parish of sales, nor by parish of residence or parish(es) hunted.

During 1965 certain work was begun to study the feasibility of using the driver's license file as a sampling frame and to examine the characteristics of the basic hunting and fishing license file as to age, sex, race and parish of residence.

A sample from the driver's license file was supplied on punched cards by the Driver's License Division of the Department of Public Safety. A mailed questionnaire was sent to the selected sample asking if the person ever hunted and/or

fished; whether they hunted and/or fished during the 1963-64 and 1964-65 season; and if they purchased a hunting and/or fishing license for these years. Estimates from this survey can be compared with certified licenses sales from Commission records and certain ratios can be established by parish of residence for future surveys.

Preliminary finding from the driver's license feasibility survey showed an estimated sales higher than the actual certified sales. However, with additional investigations involving correction factors and using extrapolation methods developed for mailed surveys, it is expected that the driver's license frame will prove acceptable. If so, this frame will be more inclusive than using basic hunting and/or fishing licenses since all persons who operate a motor vehicle over the age of 14 must have a license. Also, in viewing outdoor recreation in general and for attitude surveys, this frame is more acceptable.

In respect to characteristics of hunting and fishing license holders, a sample of the 1964-65 file was placed upon punched cards for analysis. Age, sex, race and parish of residence in relation to parish of purchase statistics are to be secured. This work is in progress at the close of the biennial period.

THE LOUISIANA COOPERATIVE WILDLIFE RESEARCH UNIT

JOHN D. NEWSOM
Unit Leader

Introduction

The Louisiana Cooperative Wildlife Research Unit was established on April 1, 1962, with the completion of a cooperative agreement between the Louisiana Wild Life and Fisheries Commission, the United States Fish and Wildlife Service Bureau of Sport Fisheries and Wildlife, the Wildlife Management Institute, and Louisiana State University. It was activated on August 22, 1962, with the appointment of the leader.

The Unit is financed jointly by the four sponsoring agencies. Louisiana State University provides space and facilities, funds for student and staff research and staff members in the School of Forestry and Wildlife Management, who serve as collaborators in planning and executing appropriate research efforts through the Unit.

The Louisiana Wild Life and Fisheries Commission provides funds for assistantships to graduate students, as well as facilities which are used by staff members and students who are conducting research.

The Bureau of Sport Fisheries and Wildlife provides salary and travel funds for the Unit Leader and the Wildlife Management Institute

provides financial assistance to the overall operation of the Unit.

Primary objectives of the Louisiana Cooperative Wildlife Research Unit are:

1. To investigate and correlate studies of the production, utilization, management and restoration of desirable populations of wildlife compatible with good land use.
2. To provide technical and professional training on various levels in wildlife management, teachings, research, demonstration and administration.
3. To demonstrate research finding through extension and practical management of game and fur-bearing animals and of other desirable species of wildlife, and encourage wildlife restoration through programs with schools, youth clubs and adult groups.
4. To make available to landowners, sportsmen, conservation officials, extension workers, teachers, and others the fact, methods and new findings discovered through research, and through literature suited to local and State conditions.
5. To disseminate research findings through the publication of scientific, semi-popular and popular reports, bulletins, circulars, and journal and magazine articles.

A brief summary of research projects completed during the past two years and a list of currently active projects are presented in the following pages.

Squirrel Habitat and Population Evaluation on Thistlethwaite Game Management Area in South Central Louisiana

A squirrel population and habitat evaluation was conducted on Thistlethwaite Game Management Area in St. Landry Parish, Louisiana during August and September, 1964.

Data were collected on 965 1/25-acre habitat survey plots located around 193 squirrel trap sites. Habitat data recorded on each plot were: number of trees in five species groups, number of trees in three tree size groups, per cent canopy closure, per cent understory cover, number of vines and the number of small tree stems. The habitat data were analyzed with the number of grey squirrels caught, number of fox squirrels caught, total number of squirrels caught, and the kill of squirrels per trap site.

The three tree size groups, blackgum-tupelogum tree group, and miscellaneous tree groups exhibited no significant influence on squirrel population data. Fox squirrel trapping success was greater in the more open areas and decreased in the more dense areas. Gray squirrels occupied the more dense areas. An increase in the number of sweetgum-elm-ash-maple trees, per cent canopy closure, per cent understory cover, number of

vines, and the number of small tree stems was accompanied by an increase in the grey squirrel population and a decrease in the fox squirrel population. The reverse occurred with an increase in the number of ironwood-hackberry-locust trees. Consistent correlations between habitat and combined fox and grey squirrel populations were not evident in the data.

Increases in the number of ironwood-hackberry-locust trees, per cent canopy closure, and the number of small tree stems were reflected in greater hunting success. Hunting success was greater near roads and pipelines.

Nutritional Analysis and Seasonal Variation of Some Herbaceous Deer Browse Plants in the Pine-Hardwood Areas of Winn and Union Parishes, Louisiana

During 1963 and 1964 a study was conducted to determine nutritional values and overall relative importance in the diet of white-tailed deer of certain herbaceous plants native to the pine-hardwood area of Winn and Union Parishes, Louisiana.

Samples of herbaceous plants known to be utilized by white-tailed deer were collected during the four seasons of the year and analyzed to determine crude protein, fat, fiber, ash, moisture, calcium, and phosphorus content. Crude protein, fat, and phosphorus contents were found to be higher in the spring while fiber and ash contents were higher in the fall.

Most of the samples were nutritionally deficient when compared to the known requirements for maximum growth and antler development of adult white-tailed deer.

Examination of rumen content and fecal pellet samples seemed to indicate that these herbaceous plants were relatively unimportant in the overall diet of deer since only two of the plants were found in the rumen samples and two in the pellet samples. However, since all of the material found in the rumen and pellet samples could not be identified, it is probable that the recorded occurrences of the study plants represent the minimum actual occurrence of these plants.

It appeared that the technique of using photomicrographs of the epidermal cells of the leaves of plants to identify plant species in fecal pellets could be of substantial importance in future deer food habit studies. There needs to be a refinement in the photomicrographic filming techniques, since clear photomicrographs are imperative if positive identification of plants is to be made. In order to conduct a deer food habit study utilizing this technique, it would be essential to have photographic reference material of all plants that occurred in the study area and might be utilized as food by deer.

Nutrient Content of Foods Utilized by Bobwhite Quail in the Longleaf Pine Type of Rapides and Evangeline Parishes, Louisiana

The objectives of this study were: (1) to determine the foods utilized by quail during the 1957-58, 58-59, and 63-64 hunting seasons in the longleaf pine habitat type of Evangeline and Rapides Parishes, (2) to determine the types of foods utilized during the 1963-64 hunting season, (3) to determine the variation in nutritive content of foods utilized during the 1963-64 season, and of food eaten with the nutritional requirements (4) to compare the results of nutritional analyses recommended for wintering quail.

An analysis of 183 quail crops showed seasonal fluctuations in major food items and the importance of a variety of tree, shrub, herbaceous and grass seed producers to quail in the longleaf forest type. Chemical analysis of foods eaten during the 1963-64 hunting season showed that there was a variation in the amounts of crude protein, ether extract, crude fiber, nitrogen-free extract, ash, calcium and phosphorus contained in foods eaten by quail during different time periods.

Most of the samples, based on standard proximate analyses, were nutritionally deficient when compared to the maintenance diet recommended for mature birds in winter. However, 14 birds killed in February had an average weight of 6.5 ounces.

A study of the Factors that Influence the Establishment of Natural and Artificial Stands of Wigeongrass (*Ruppia maritima*) on Rockefeller Refuge, Cameron Parish, Louisiana

This study was conducted on Rockefeller Wildlife Refuge which is owned and operated by the Louisiana Wild Life and Fisheries Commission to determine (1) factors that influence natural and artificial establishment of wigeongrass, (2) vegetative production of wigeongrass, and (3) waterfowl utilization of wigeongrass.

Physical factors such as turbidity, fluctuating water levels and water depth were found to be controlling factors in the establishment of new stands and also to mature stands of wigeongrass. Correlations were found between water depth and turbidity and vegetative production. Greatest production was obtained with a water depth of 24 inches.

Chemical factors such as per cent of soluble salts inhibited seed germination by increasing osmotic pressure of the soil solution so that the seed had difficulty in getting water. Soluble salts present in the soil which exceed 1.12 per cent is

extremely harmful to germination of wigeongrass seed. Wigeongrass was observed growing in salinity ranges of 2,075 ppm to 18,500 ppm in the study ponds and 1,160 ppm to 19,000 ppm in the experimental tanks. There was correlation between chlorides and growth of wigeongrass.

The most important biotic factor affecting plant growth was algae cover. Algae overshadowed and crowded out wigeongrass by reducing light. Wigeongrass was found to have two growing seasons that are controlled by a temperature range of 18.5°C to 30°C. When the temperature was above 30°C or below 18.5°C growth apparently ceased.

Foods and Feeding Habits of the Common Snipe (*Capella gallinago delicata*) in the Cameron Parish, Louisiana Marsh, with Ecological Notes and a Discussion of Methods of Sexing and Aging

A study of foods utilized by snipe and foods available to them during fall, winter and spring was conducted in the Cameron Parish marsh during the period from October, 1962, through April, 1963. During this period, 307 snipe and 86 soil samples were collected for analysis.

Ecological notes on feeding habits were obtained and external methods of sexing and aging were studied.

It was found that the food of snipe in this area was made up of 42.38 per cent plant material and 57.62 per cent animal material. However, this percentage varied considerably at different seasons of the year and in different ecological situations.

Plant foods of major importance were plant debris, and seeds of saw grass (*Cladium jamaicensis*), sesbania (*Sesbania* sp.), buckbrush (*Iva frutescens*), fall panicum (*Panicum dichotomiflorum*), smartweed (*Polygonum* sp.), *Scirpus* sp. and vetch (*Vicia* sp.). Animal foods of major importance were beetles in the families Carabidae, Curculionidae, Hydrophilidae and Scarabaeidae; fly larvae (Diptera), wasp pupae (Hymenoptera), snails, Isopods and spiders.

Animal food was most important in early fall and least important in the spring; this was found to coincide closely with percentage availability.

This study demonstrated that snipe could be sexed externally by the width of the first secondary flight feather; snipe having a first secondary width of 14 mm. or less are males, and those having a first secondary width of 15 mm. or over are females.

Since a valid internal criterion for distinguishing immature male from mature male snipe could not be established, only female snipe were used in the external aging study. It was found that the upper-outer primary coverts of female snipe have

a broad white tip and in immature female snipe the white tip is absent or very narrow. This criterion accurately aged all adult female snipe and 97.8 per cent of the immature female snipe.

The Relationship of Browse Production and Availability to the Physical Condition of Deer

The relationship of available summer browse production to the physical condition of deer was compared on two bottomland hardwood areas of similar vegetative ecology, one with a high deer population, Chicago Mill Wildlife Management Area, and one with a low deer population, Russell Sage Wildlife Management Area. Browse production of 15 preferred browse species was inventoried by the use of 1/4-mil-acre plots at two chain intervals along transect lines that were run across the topography at 1/2-mile intervals. Approximately 10,000 acres of each area were inventoried. Samples of each species were collected and weighed in order to arrive at a browse production figure in pounds per acre.

Physical condition of deer on both areas was determined by weights and measurements of hunter-killed deer taken during the 1964 hunting season.

It was found that in age classes 1 1/2 through 4 1/2 Russell Sage deer were consistently heavier than Chicago Mill deer, by an average of from 20 pounds to 40 pounds per deer, in the various age classes. Russell Sage deer also had better antler development, and had generally better physical development.

However, during the summer period in which the vegetative survey was made, the Chicago Mill Management Area had 1.68 times as much available browse as the Russell Sage Management Area.

This apparent inverse relationship of browse supply to physical condition of deer was attributed to the greater influence of ecological conditions, rather than the impact of deer, upon browse production. The greater abundance of browse on Chicago Mill was apparently caused by better ecological conditions favoring the growth of browse, whereas browse production on Russell Sage was inhibited by a dense crown canopy, poor drainage and low soil fertility.

Results of this study indicate that a summer browse survey, at least in these areas, cannot be used as an indicator of deer density, or as an indicator of physical development of deer.

Biological Studies Within the Coastal Marsh Area East of Calcasieu Lake, Louisiana

From August, 1963, to November, 1964, a biological study was conducted in the marsh east of

Calcasieu Lake, Louisiana. The primary purposes of this study were to determine water salinity levels along the eastern shore of Lake Calcasieu and its eastern distributaries, vegetative composition of marsh and the correlation between salinity levels and vegetative types.

Salinity levels were found to range from 8-12 ppt in Calcasieu Lake and approximately 2 ppt near the eastern extremity of North Prong of Grand Bayou, the easternmost point of the study area accessible by boat. There was a close correlation between water salinities and vegetative types; saltmarsh grass (*Distichlis spicata*) and wire grass (*Spartina patens*) were dominant in the higher salinity areas near the lake, while fall panicum (*Panicum dichotomiflorum*), alligator weed (*Alternanthera philoxeroides*) and bull-tongue (*Sagittaria* sp.) dominated the easternmost, less saline, portions of the study area.

Clapper Rail (*Rallus longirostrus*) Studies on Grand Terre Island, Jefferson Parish, Louisiana

This study was conducted during the period from September, 1963 to June, 1965. Primary objectives of the study were to investigate, develop and field test for effectiveness, methods of trapping, field marking and externally sexing and aging clapper rails.

Four types of traps were developed and tested. Some rails were caught in each type of trap; however, an unusually high degree of success was experienced with one. A box trap with drop doors, used in conjunction with a drift fence, was highly successful in this marsh type.

Experimental color marking of confined rails indicated that collars were superior to wing streamers or back tags for identification of individual rails in the field.

Analysis of food habits of hunter-killed and collected rails revealed that their diet was made up almost entirely of small crabs (*Uca* sp. and *Sesarma* sp.) and snails (*Littoripa* sp., *Melampus* sp., and *Odostomia* sp.). Twenty (20) of 52 rails examined were infested with *Acanthocephala*.

Careful studies of plumage coloration and development failed to reveal consistent distinguishing characteristics between sexes or age groups of clapper rails. Measurements of weights, bill length and middle toe length failed to reveal a criterion for aging clapper rails; however, the study did reveal that weight could be used as a method of sexing these birds with a reasonably high degree of accuracy. It was found that rails weighing over 290 grams could be classed as females and those weighing under 290 grams could be classed as males with a 95 per cent accuracy.

The Economic Impact of the Louisiana Deer Hunter on Communities Surrounding the Chicago Mill Game Management Area in Louisiana

A study to determine the economic value of deer hunting to communities surrounding the Chicago Mill Game Management Area was conducted from November, 1964, to May, 1965.

Questionnaires were mailed to 2,059 hunters whose names had been obtained from check stations maintained on the management area during the five day hunt. The questionnaires requested that each hunter supply information on total expenditures, in various categories, incurred during his hunt on the management area. Questionnaires were followed up with a personal interview with a number of respondents selected at random.

Data were obtained on expenditures for the following items on each day they hunted: automobile, lodging, food, clothing, weapons, ammunition, camping equipment and other expenses.

Results of the survey indicated that local hunters, those from the surrounding parishes (counties) of Franklin, Madison and Tensas, spent an average of \$13.55 per hunting effort and foreign hunters, those from the rest of the state and out-of-state, spent an average of \$45.59 per hunting effort. This amounted to an expenditure of \$258,775.49 during the five day hunting season on this 100,000 acre management area. It was not possible in this study to determine the portion of this total expenditure that was contributed to the local economy; however, it was obvious that a major portion of the total expenditure was made in local areas surrounding this management area.

List of Projects

1. Basic Survey of Wildlife Populations and Harvest Data in Louisiana—John R. Akin & Bryant A. Bateman—5
2. The Influence of Salinity and Water Levels on Survival and Growth of Wiregrass (*Spartina patens*) and Saltmarsh Grass (*Distichlis spicata*)—Kenneth M. Babcock & Leslie L. Glasgow—Unit funds
3. The Incidence and Range of Infection of the Brainworm (*Pneumoststrongylus tenuis*) in White-tailed Deer on Three Management Areas in Louisiana—Don J. Bethencourt & John D. Newsom—1 & 5
4. Food Habits of the Common Snipe (*Capella gallinago delicata*) in the Rice Fields of Southwest Louisiana—Thurman W. Booth, Jr. & Leslie L. Glasgow—59 & 1
5. Ecological Studies of the Black Francolin (*Francolinus francolinus*) in the Gum Cove Area of Cameron Parish, Louisiana—Billy R. Craft & Leslie L. Glasgow—6 & 1

6. Survival, Dispersal and Reproductive Success of the Black Francolin (*Francolinus francolinus*) in Morehouse Parish, Louisiana—James W. Emfinger & John D. Newsom—Unit funds
7. Food Intake and Weight Gain in White-tail Deer Fawns—James Fowler & John D. Newsom—Southern Forest Experiment Station, U.S. Forest Service & Unit funds on a 50-50 basis
8. Development and Testing of Cultural Machines for Improvement of Marshlands for Wildlife and Cattle—Larry L. McNease & Leslie L. Glasgow—Hatch Act Forest Research Funds & 1
9. Ecology of the Wood Rat (*Neotoma floridans*) on the Thistlethwaite Wildlife Management Area in Louisiana—Wendell A. Neal & Leslie L. Glasgow—McIntire-Stennis Forest Research Fund
10. Food Habits of the Common Snipe (*Capella gallinago delicata*) in Pastures of South Central Louisiana—Jerald V. Owens & Leslie L. Glasgow—59
11. The Ecology and Management of Three-cornered Rush (*Scirpus olneyi*) and Leafy Three-cornered Rush (*Scirpus robustus*) in the Louisiana Marshes—A. W. Palmisano & John D. Newsom—Unit funds
12. Breeding Seasons of White-tailed Deer (*Odocoileus virginianus*) in Three Regions of Louisiana—John H. Roberson, Jr. & John D. Newsom Unit funds
13. Food preferences of Swamp Rabbits (*Sylvilagus aquaticus*) for Selected Plants—Alfred D. Sullivan & John D. Newsom—Unit funds
14. Red Junglefowl (*Gallus gallus murghi*) Release Study in Louisiana—James W. Turk & Leslie L. Glasgow—6
15. Food Habits of Coyotes (*Canis latrans*) in Louisiana—William C. Wilson & John D. Newsom—1
16. The Effects of Herbicidal Hardwood Control on Wildlife Habitat—Don Lee & John D. Newsom—5, 1, & 4
17. The Diseases and Parasites of Mississippi Turkeys and Their Effect on Population Densities and Management—Harry C. Clark, Bryant A. Bateman, & Joseph M. Dixon—6 (Mississippi Game and Fish Commission)
18. Diseases of Game Birds in Louisiana—John D. Newsom & Joseph M. Dixon (Department of Veterinary Science)—59

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ing waterfowl and waterfowl habitat on Catahoula Lake, Louisiana. Louisiana State University, M. S. Thesis, 96 pp. (Typewritten).

1964-65

HUNTING, FISHING AND TRAPPING REGULATIONS

Conservation laws are not designed by the state or federal government to deprive people from taking our natural resources. These regulations are necessary for the proper management of our fur, game and fish in order to assure the trapper, hunter and fisherman a never ending supply of these valuable resources. Your cooperation is necessary for the success of the conservation program.

1964-65 Hunting Seasons

RESIDENT GAME BIRDS AND ANIMALS

(Shooting Hours—one-half hour before sunrise to sunset)

QUAIL: November 26—February 14; Daily Bag 10; Possession 20.

RABBIT: October 3—February 14; Daily Bag 8; Possession 16.

SQUIRREL: October 3—January 10; Daily Bag 8; Possession 16.

BEAR: December 26—December 30; Daily Bag 1, Season Limit 1. See schedule and map, page 10.

TURKEY: April 3—April 18; Daily Bag, Gobblers only; Season Limit. See schedule and map, page 10.

DEER: See Deer Hunting Schedule.

ARCHERY SEASON: October 17—November 22, 1964, Inclusive (See Deer Hunting Schedule)

COMMERCIAL HUNTING PRESERVES: October 1—March 31, Pen-raised birds only.

1964-65 Migratory Regulations

DOVES: 3 way split: September 5—September 20, 16 days; October 17—November 8, 23 days; December 5—January 4, 31 days; Bag Limit 12; Possession 24.

DUCKS: November 21—December 30. Daily bag limit 4, possession 8. Limit may not include more than 2 mallards daily or 4 possession; 2 wood ducks daily or possession; 2 canvasbacks or 2 redheads or 1 of each daily or possession.

Bonus Ducks—Additional to above limits
Scaup- (bluebill, dos gris): South of U. S. Hwy. 190 only; daily bag limit 2, possession 4. American, redbreasted and hooded merganzers: Daily bag limit 5, possession 10 in the aggregate of these species. Limit may not include more than 1 hooded merganser daily or 2 possession.

COOTS: November 21—December 30. Daily bag limit 10, possession 20.

GEESE: November 7—January 15. Daily bag possession limits 5. Limit may not include more than 2 white-fronted geese (speckle-bellies). Closed season on Canada Geese.

RAILS AND GALLINULES: October 3—November 21; Bag limit 15; Possession 30. Singly or in the aggregate of all species.

WOODCOCK: November 26—January 14; Bag Limit 5; Possession 10.

SNIPES (Wilson's): November 26—January 14; Bag Limit 8; Possession 16.

SHOOTING HOURS:

1. Doves: 12:00 noon to sunset.

2. Ducks, Coots, Geese, Rails, Gallinules, Snipe and Woodcock; sunrise to sunset.

Use of bait and live decoys prohibited. Hunters of ducks and geese who have reached their 16th birthday must have a federal waterfowl stamp attached to required state hunting license or permit. A federal waterfowl stamp may be obtained from any U. S. Post Office. Use of rifles, or shot-guns larger than 10 gauge or capable of holding more than three shells prohibited. The plug used in guns must be incapable of being removed without disassembling gun. No persons shall kill or cripple any migratory game bird without making a reasonable effort to retrieve the bird and include it in his daily bag limit. Legal possession limits of game birds or game animals may be possessed up to within 30 days of the opening of the following

Permanent Closed Season—Swan, Whooping and Sandhill Cranes, Kildeer, Prairie Chickens, Upland Plover, or Papabotte, Black Bellied and Golden Plover or any other shore birds (except Woodcock, and Wilson's or Jacksnipe), have no open season for hunting.

GROSBEC (Night Heron)—It is against Federal and State laws to kill Grosbecks or any other kind of Herons, Egrets or Cranes at any time.

OUTLAW BIRDS—Cormorants (nigger geese), vultures (buzzards), great horned owls, duck hawks, sharp-shinned and cooper hawks (blue darters), crows, red-winged black birds (rice birds), English sparrows, starlings and, when destructive to crops, grackles (chocks) and bob-o-links (true rice birds).

OUTLAW QUADRUPEDS—Wolves, foxes, wildcats (bobcats or catamounts), cougars (panthers).

Deer Hunting Schedule

A. Bag: One legal deer per day: 3 Legal deer per season.*

*The turkey tag attached to the big game license has been authorized to be used as a third deer tag. When a third deer is taken, detach the tag, punch the day, write in the month and attach tag to third deer. A special turkey tag will be issued prior to the turkey season at commission district offices to any hunter who produces his Big Game license and has used the turkey tag as a deer tag.

B. Legal buck is defined as a deer with antlers not less than three inches in length. The killing of bucks with antlers less than three inches and doe deer is prohibited except where specifically permitted.

C. Deer hunting restricted to legal bucks only, except where otherwise specifically permitted.

D. Either sex deer, or any deer, is defined as any male or female deer, except spotted fawns which are protected, taken in any area designated and regulated as such.

E. Still Hunting Only prohibits the use of dogs for hunting or the training of dogs in areas so designated, including game management or refuge areas. In all other areas, deer hunting will be permitted with or without the use of dogs.

F. All areas not specifically designated as being open are hereby closed.

G. Archery season: October 17-November 22, 1964.

The taking of deer permitted in all areas declared open for deer hunting, including all game management areas except the following: Litcher-Moore, Zemurray, Thistlethwaite, Saline, Soda Lake and Concordia. Either sex deer may be taken in all open areas except in Grant, Union, LaSalle, Evangeline, Sabine, Washington, Iberville, East Carroll, West Feliciana, Claiborne, Morehouse, Tangipahoa, Concordia, Livingston, Franklin and Vernon Parishes. Permits required for hunting on game management areas. For details, see provisions under game management area schedule. Special bow and arrow regulations: Arrows used for hunting deer shall have well sharpened metal broadhead blades not less than 7/8 inch in width. The following shall be unlawful:

1. To have in possession any gun while hunting with bow and arrow during the special bow and arrow deer season.

2. To have in possession, or under control while hunting, any poisoned arrows, arrows with explosive tips, or any bow drawn, held or released by mechanical means.

3. To hunt deer with a bow having a pull less than 30 pounds.

DESCRIPTION OF AREAS

40 Days With or Without Dogs; November 27—December 20; December 26—January 10, 1965.

Area No. 1: E. Baton Rouge, St. Landry, Pointe Coupee, West Baton Rouge, Iberville, St. Martin, Lafayette, Iberia, Vermilion, St. Mary, Terrebonne, Assumption, St. James, Ascension, St. John, St. Charles, Lafourche, Jefferson,

Plaquemines, St. Bernard, Orleans, Livingston, Tangipahoa, and St. Tammany Parishes.

South of La. Hwy. 14 from Cameron-Vermillion Parish line to New Iberia, east of U. S. Hwy. 90 from New Iberia to Lafayette, east of U. S. Hwy. 167 from Lafayette to Opelousas, south of U. S. Hwy. 190 from Opelousas to its junction with U. S. Hwy. 71, east of U. S. Hwy. 71 from the junction of U. S. Hwy. 190 to LeBeau, south of La. Hwy. 10 from LeBeau to La. Hwy. 360, east of La. Hwy. 360 from La. Hwy. 10 to the Atchafalaya River, east and south of the Atchafalaya River and lower Old River from La. Hwy. 360 to the Mississippi River, west of the Mississippi River from lower Old River to La. Hwy. 22 (Ascension Parish) south of La. Hwy. 22 from Mississippi River to Sorrento to Springfield to the Tchefuncte River, west of the Tchefuncte River from La. Hwy. 22 to Lake Pontchartrain, west and south of Lake Pontchartrain to Lake Borgne, and south and east of Lake Borgne to the Mississippi Sound. Included is Profit Island in East Baton Rouge Parish. EXCEPT: That area as designated as No. 16 which is Still Hunting Only.

33 Days, With or Without Dogs; November 27—December 13; December 26—January 10, 1965.

*Area No. 2***: Morehouse, East Carroll, West Carroll, Madison, Richland, Franklin, Tensas, Catahoula, LaSalle, Concordia, West Feliciana, Avoyelles, and St. Landry.

East of Ouachita River from Arkansas line to Hwy. 2 at Sterlington. North of Hwy. 2 to junction of U. S. Hwy. 165, east of U. S. Hwy. 165 to junction of La. Hwy. 134, North of La. Hwy. 134 from U. S. Hwy. 165 to Little Bayou Bouef, East of Little Bayou Bouef to Lafourche Drainage Canal, North of Lafourche Drainage Canal (Irwin Lake) to Gum Ridge Road. West of Gum Ridge Road from the Lafourche Drainage Canal to La. Hwy. 134 from Gum Ridge Road to Bouef River; North and West of Bouef River from La. Hwy. 134 to La. Hwy. 588; North of La. Hwy. 588 from Bouef River to Pioneer; East of La. Hwy. 17 from Pioneer to Winnsboro; East and South of La. 15, Deer Creek, Bouef and Ouachita Rivers from Winnsboro to Jonesville; south and east of U. S. Hwy. 84, Old River, Catahoula Lake, Big Saline Bayou, and Big Creek from Jonesville

to La. Hwy. 115; East of La. Hwy. 115 from Big Creek to Bunkie; East of U. S. Hwy. 71 from Bunkie to LeBeau, North of La. Hwy. 10, from LeBeau to La. Hwy. 360, West of La. Hwy. 360 from La. Hwy. 10 to the Atchafalaya River, West and North of Atchafalaya River and Lower Old River from La. Hwy. 360 to Mississippi River.

*Area No. 3****: Rapides, Beauregard, Allen, Evangeline, St. Landry, Vernon, and Avoyelles Parishes.

South and East of La. Hwys. 28, 112 and 113 from Alexandria to Union Hill through Pitkin to Sugartown to U. S. Hwy. 171; East of U. S. Hwy. 171 from La. Hwy. 112 to Ragley; North of U. S. Hwy. 190 from Ragley to Opelousas; West of U. S. Hwy. 167 from Opelousas to Ville Platte; West of La. Hwy. 29 from Ville Platte to Bunkie; West of U. S. Hwy. 71 from Bunkie to Alexandria.

Area No. 4: Winn, Caldwell, LaSalle, Grant, Rapides, Natchitoches, Jackson and Bienville Parishes.

East of Red River from the Grant-Rapides Parish line to Saline Bayou; East of Saline Bayou to Black Lake Bayou; East of Black Lake Bayou to La. Hwy. 155; South of La. Hwy. 155 to La. Hwy. 9; South and West of La. Hwy. 9 to La. Hwy. 126 to Dugdemona Creek; East of Dugdemona Creek to La. Hwy. 4; South of La. Hwy. 4 to Vixen; West of parish road from Vixen to La. Hwy. 126; North of La. Hwy. 126 to La. Hwy. 127; West of La. Hwy. 127 to U. S. Hwy. 165; West of U. S. Hwy. 165 to Little River; West of Little River to the Grant-Rapides Parish line; North of the Grant-Rapides Parish line to Red River.

Area No. 5: Natchitoches and Red River Parishes.

South of La. Hwy. 174 from Ajax to intersection of La. Hwy. 1; East of La. Hwy. 1 to intersection of U. S. Hwy. 84 at Armstead; South and West of U. S. Hwy. 84 and U. S. Hwy. 71 from Armstead to Clarence; North and West of La. Hwy. 6 from Clarence to Natchitoches; West of La. Hwy. 1 from Natchitoches to Derry; West of La. Hwy. 119 from Derry to Gorum; North and West of the Kisatchie-Mink-Gorum Road (La. Hwy. 118) to Kisatchie; East of La. Hwy. 117 from Kisatchie to Vowell's Mill Road; North and East of Vowell's Mill Road (La. Hwy. 478) to Robeline; North and East of La. Hwy. 120 to Marthaville; East of La. Hwy. 487 from Marthaville to Ajax.

Area No. 6: Sabine, DeSoto, and Vernon Parishes. South of U. S. Hwy. 84 from Texas line to

**Either sex deer shall be legal during the first 5 days of the open season in that portion of Madison Parish south of U. S. Hwy. 80 extending to the Madison-Tensas Parish line and bounded on the West by State Route 577 to Bayou Macon and on the East by U. S. Hwy. 65 from Tallulah South to the Turnable Road (Hwy. 603), and by Turnable Road to the Sevier-Watts Road (Madison Parish Road G/1) and along the Sevier-Watts Road to Madison-Tensas Parish line. All of Tensas Parish except Ward 3.

***Either sex deer shall be legal on November 27 in that portion of the area South and East of La. Hwy. 28 from Alexandria to Hinston; North of La. Hwy. 112 from Hinston to Leconte; West of U. S. Hwy. 71 from Leconte to Alexandria.

Logansport to Mansfield; West of U. S. Hwy. 171 from Mansfield to Leesville; North of La. Hwy. 8 from Leesville to Burr Ferry to Texas line.

Area No. 7: Beauregard and Calcasieu Parishes. South of Anacoco Bayou; West of La. Hwy. 111, and South of U. S. Hwy. 190 from the Texas line to DeRidder; West of La. Hwy. 27 from DeRidder to Sulphur and North of U. S. Hwy. 90 from Sulphur to the Texas line.

21 Days, With or Without Dogs; November 27—December 6; December 26—January 5, 1965.

Area No. 8: Winn, Jackson, Caldwell, Ouachita, Franklin, Catahoula, LaSalle, Union, Lincoln, Bienville, Morehouse, Claiborne and Richland Parishes.

West of Ouachita River from Arkansas line to Sterlington; South of La. Hwy. 2 from Sterlington to U. S. Hwy. 165; to junction of La. Hwy. 134; South of La. Hwy. 134 from U. S. Hwy. 165 to Little Bouef Bayou; West of Little Bouef Bayou from La. Hwy. 134 to Lafourche Drainage Canal; South of Lafourche Drainage Canal to Gum Ridge Road; East of Gum Ridge Road to La. Hwy. 134; South of La. Hwy. 134 from Gum Ridge Road junction to La. Hwy. 183; West of La. Hwy. 183 to U. S. Hwy. 80 at Holly Ridge; North of U. S. Hwy. 80 from Holly Ridge to Rayville; West of La. Hwy. 137 from Rayville to Archibald; West of La. Hwy. 15 from Archibald to Deer Creek; West of Deer Creek and Ouachita River to Jonesville; North of U. S. Hwy. 84 from Jonesville to Jena; North of La. Hwy. 772 and La. Hwy. 8 from Jena to Little River; East of Little River to junction of U. S. Hwy. 165; East of U. S. Hwy. 165 from Little River to junction of La. Hwy. 127; North of La. Hwy. 127 to junction of La. Hwy. 126; North of La. Hwy. 126 to Parish road from Chester to Vixen; North of La. Hwy. 4 from Vixen to Jonesboro; East of La. Hwy. 147 from Jonesboro to Arcadia; East of La. Hwy. 518 from Arcadia to Lisbon; South of La. Hwy. 2 from Lisbon to Bernice; East of U. S. Hwy. 167 from Bernice to Arkansas line.

Area No. 9: West Feliciana Parish.

South of Como Bayou from Mississippi River to abandoned L & A Railroad; West of L & A Railroad from this junction to Bayou Sara; West and North of Bayou Sara from abandoned Railroad to Mississippi River; North and East of Mississippi River from Bayou Sara to Como Bayou.

Area No. 10: Washington and St. Tammany Parishes.

East and South of La. Hwys. 25 and 10 from Mississippi line to Tchefuncte River; East of Tchefuncte River from La. Hwy. 10 to Lake

Pontchartrain; North of Lake Pontchartrain, Rigolets and Lake Borgne from Tchefuncte River to Mississippi line.

28 Days; 9 Days Still Hunting; November 7—November 15; 19 Days With or Without Dogs; November 27 through December 6, with November 27 being legal for either sex deer except in the parishes indicated†; December 26 through January 3, with or without dogs; bucks only.

Area No. 11: Caddo, Webster, Claiborne, DeSoto, Red River, Union, Bienville, Jackson, Winn, Lincoln, Sabine, Natchitoches, and Bossier.

West of U. S. Hwy. 167 from Arkansas line to Bernice; North and West of La. Hwys. 2, 518, and 519 from Bernice to Lisbon to Arcadia; West of La. Hwy. 147 and U. S. Hwy. 167 from Arcadia to Jonesboro; North of La. Hwy. 4 from Jonesboro to Dugdemona Creek to La. Hwy. 126; North of La. Hwy. 126 to La. Hwy. 9; East of La. Hwy. 9 from La. Hwy. 126 to La. Hwy. 155; North of La. Hwy. 155 to Mill to Readhimer to Saline to Ashland to Black Lake Bayou; West of Black Lake to La. Hwy. 9; North of La. Hwy. 9 from Black Lake to intersection U. S. Hwy. 71 and La. Hwy. 84; East of U. S. Hwy. 71 and La. Hwy. 84 from junction of La. Hwy. 9 to Coushatta; North of La. Hwy. 84 from Coushatta to Armstead; West of U. S. Hwy. 1 from Armstead to Lake End; North of La. Hwy. 174 from Lake End to Converse; East of U. S. Hwy. 171 from Converse to Mansfield; North of U. S. Hwy. 84 from Mansfield to Logansport to the Louisiana, Texas line; except Barksdale Air Force Base which shall be open for still hunting only for either sex deer during the above described dates.

19 Days; 9 Days Still Hunting; November 7—November 15; 10 Days With or Without Dogs; November 27—December 6.

Area No. 12: Sabine, Natchitoches, Vernon Parishes.

South of La. Hwy. 174 from Converse to Ajax; West of La. Hwy. 487 from Ajax to Marthaville; South and West of La. Hwy. 120 from Marthaville to Robeline; West of Robeline—Vowell's Mills Road; South and West of La. Hwys. 478 and 117 from Vowell's Mills to Leesville; East and North of U. S. Hwy. 171 from Leesville to Converse.

Area No. 13††: Rapides Parish.

North and East of Red River from the Avoyelles-Rapides Parish line to the Rapides-Grant Parish boundary; South of the Rapides-Grant boundary to the LaSalle Par-

†Only buck deer will be legal in that part of Union, Sabine, Lincoln, Jackson, Winn, Natchitoches and all of Claiborne and Bossier Parishes except Bodcau Game Management Area where either sex deer will be legal on November 27, 1964.

††Either sex deer legal November 27 only.

ish boundary; West of the Rapides-LaSalle boundary and Rapides-Avoyelles boundary to Red River.

19 Days; 9 Days Still Hunting; November 7—November 15; 10 Days, With or Without Dogs; November 27—December 6.

Area No. 14: East Feliciana, East Baton Rouge and St. Helena Parishes.

West of La. Hwy. 441 from Mississippi line to junction of La. Hwy. 16, north of La. Hwy. 16 from La. Hwy. 441 to Amite River at Dennis Mills, West of Amite River from Dennis Mills to Stony Point; North of Stony Point—Burch Road from Stony Point to Fred; and East of La. Hwy. 67 from Fred to Mississippi Line.

16 Days Still Hunting Only; November 7—November 22. (November 27†††)

Area No. 15: Natchitoches, Vernon, Beauregard, Calcasieu, Jefferson Davis, Allen, Rapides and Avoyelles Parishes.

East of U. S. Hwy. 171 from DeRidder to Leesville; East of La. Hwy. 117 from Leesville to Kisatchie; South of Kisatchie—Mink Gorum Road; East of La. Hwys. 119, 1 and 6, from Gorum to Red River; West of Red River from La. Hwy. 6 to La. Hwy. 115; West of La. Hwy. 115 from Red River to U. S. Hwy. 71 at Bunkie; East of U. S. Hwy. 71 from Bunkie to Alexandria; North and West of La. Hwys. 28, 112, 113 and 112 from Alexandria to Union Hill to Pitkin to Sugartown to U. S. Hwy. 171; West of U. S. Hwy. 171 from La. 112 to Ragley; South of U. S. Hwy. 190 from Ragley to Kinder; West of U. S. Hwy. 165 from Kinder to Iowa; North of U. S. Hwy. 90 from Iowa to Sulphur; East of La. Hwy. 27 from Sulphur to DeRidder.

16 Days, Still Hunting Only; November 7—November 22.

Area No. 16: St. John the Baptist Parish.

South of Pass Manchac from Lake Pontchartrain to U. S. Hwy. 51; East of U. S. Hwy. 51 from Pass Manchac to La. Hwy. 638 (Frenier Beach Road) and North of La. Hwy. 638 from U. S. Hwy. 51 to Lake Pontchartrain. Shore of Lake Pontchartrain from La. Hwy. 638 to confluence of Pass Manchac.

5 Days, With or Without Dogs; November 27—December 1.

Area No. 17: East Baton Rouge, Ascension and Livingston Parishes.

†††Either sex deer shall be legal on November 27 in that portion of the area East of U. S. Hwy. 171 from DeRidder to Leesville; South of La. Hwy. 28 from Leesville to Lacamp; West of La. Hwys. 489 and 399 from Lacamp to Pitkin; West of La. Hwy. 113 from Pitkin to Sugartown; North of La. Hwy. 112 from Sugartown to DeRidder.

East of U. S. Hwy. 61, from U. S. Hwy. 190 to La. Hwy. 42, North of La. Hwy. 42 from U. S. Hwy. 61 to La. Hwy. 447 at Port Vincent, West of La. Hwy. 447 from Port Vincent to U. S. Hwy. 190 at Walker, South of U. S. Hwy. 190 from Walker to U. S. Hwy. 61.

Hunting and Sport Fishing Licenses

Hunting: (All Basic licenses exclude Big Game—Deer, Bear and Turkey Hunting)

1964-65 SEASON

1. Basic Resident\$ 2.00
2. Basic Non-Resident, Season\$ 25.00
3. Basic Non-Resident, Two consecutive days\$ 5.00
4. Big Game, Resident and Non-Resident\$ 2.00
(Basic License required before this License can be issued)

HUNTING CLUB:\$ 5.00

COMMERCIAL HUNTING PRESERVE

(Pen raised birds only)\$200.00

- Non-Resident Preserve Hunting, Four consecutive days\$ 5.00
(Good only on preserve where issued. This license or Basic license may be used on preserve.)

Game Breeder 10.00
Raising and selling wild birds, game or fur bearers.

FISHING:

JULY 1, 1964-JUNE 30, 1965

1. Resident\$ 1.00
2. Non-Resident, annual\$ 5.00
3. Non-Resident, Seven consecutive days\$ 2.00

EXCEPTIONS AND EXEMPTIONS—Hunting and Fishing License fees:

1. Persons in the Armed Forces of the United States, on active military duty, shall for license purposes be given resident privileges.
2. Persons under sixteen years of age, whether residents or non-residents of the state, shall not be required to obtain licenses or pay fees to fish or hunt and shall be issued a permit and tags to hunt Deer, Bear or Turkey if requested.
3. No Fishing license fee is required of a resident using a rod (or fishing pole) or hook and line, without a reel or artificial bait.
4. Any person over 60 years of age, resident of the state the two years next preceding application shall be issued free hunting and fishing permits.
5. Any Non-Resident who owns or leases a resort cottage on an annual basis and occupies such cottage for more than thirty

days during the year may obtain a Basic Resident hunting license.

6. Any Non-Resident who owns property touching any well known lake or hunting club and of an assessed value of five hundred dollars or more, and who spends as much as thirty days of each year upon the property, may obtain resident fishing and hunting licenses. This does not apply if the property is in the name of a club, company, or corporation.

Trapping and Fur Licenses

TRAPPING	\$ 2.00
FUR BUYER, Resident	\$ 25.00
FUR BUYER, Non-Resident	\$100.00
FUR DEALER, Resident (\$500 deposit required)	\$150.00
NON-RESIDENT DEALER (\$1000.00 deposit required)	\$300.00

FUR TAX

State severance tax on all skins or hides taken from any wild fur-bearing animal or alligator within the State must be paid to the Wild Life and Fisheries Commission by the dealer or by the trapper shipping his own catch out of the State. All packages of furs shipped within or without the State must carry official department tags.

The severance tax on skins and hides is as follows:

Muskrat 1 cent; Opossum 1 cent; Skunk 1 cent; Civet Cat 1 cent; Ring-tail Cat 1 cent; Wild Cat 1 cent; Fox 1 cent; Wolf 1 cent; Raccoon 1 cent; Mink 10 cents; Nutria or Coypu 2 cents; Otters 25 cents; Alligators, from 5 to 10 feet, 5 cents; Alligators, over 10 feet, 25 cents.

1954-65 TRAPPING SEASON

MUSKRAT AND BEAVER: December 1—February 25.

NUTRIA: November 15—March 20.

MINK: November 15—January 10.

All other Fur Bearers: November 15—February 15

Above listed seasons do not apply to the areas in Plaquemines parish lying south of Empire ship channel and locks.

All Fur Bearers: December 1—March 20.

(Above described areas only)

ALLIGATOR: Season to be announced.

Commercial Fishing and Dealer Licenses

CLASS

50	<i>Oyster Tonnage</i> (Minimum Fee)	\$ 1.00
	Vessel license based on carrying capacity. \$.50 per ton (1 ton=20 bbl.)	
51	<i>Oyster Dredging</i>	50.00
	Vessel using scrapers, dredges or implements other than hand tongs.	

52	<i>Oyster Shop & Resale</i>	
	Wholesale oyster dealer license	
	10,000 bbls or 1-5 shuckers	10.00
	15,000 bbls or 6-9 shuckers	15.00
	20,000 bbls	20.00
	Over 20,000 bbls or 10 or more shuckers	25.00
70	<i>Commercial Fisherman, Retail Bait Seller</i>	5.00
	Required for all commercial fishing not requiring special netting license. Used to catch and/or sell bait species retail. <i>Retail Dealer license-class 80</i> may be used to sell bait.	
71	<i>Hoop Net</i> (15 Nets)	5.00
72	<i>Fresh Water Fish Seine</i> (100 Yards)	5.00
73	<i>Fresh Water Fish Trammel Net</i> (100 Yards)	5.00
74	<i>Fresh Water Fish Gill Net</i> (100 Yards)	5.00
75	<i>Salt Water Fish or Shrimp Seine</i>	
	Fish Seine 100-500 ft.	10.00
	Fish Seine 500-2000 ft.	20.00
	Fish Seine over 2000 ft.	25.00
	Shrimp Seine 100 ft. or less	10.00
	Shrimp Seine 100-500 ft.	15.00
	Shrimp Seine 500-2000 ft.	25.00
	Shrimp Seine 2000-3000 ft.	30.00
76	<i>Salt Water Fish Trammel Net</i> (Same as Fish Seine Class 75)	
77	<i>Salt Water Fish or Shrimp Vessel</i> (Vessel affidavit required with application)	
	Vessel 40 ft. or less	5.00
	Vessel over 40 ft.	10.00
	This license or Vessel license obtained with <i>Class 84</i> (Shrimp Trawl-Vessel) required for registered boats and documented Vessels (except menhaden vessels) using salt water netting.	
78	<i>Non-Resident Fish or Shrimp Vessel</i> (Same as Class 77). This license or Vessel license obtained with <i>Class 85</i> required	
79	<i>Menhaden Seine-Vessel</i> (Vessel affidavit required with application)	
	Vessel license	50.00
	Each Seine in Use	50.00
80	<i>Retail Dealer—Fish & Seafood</i>	5.00
	Persons or firms purchasing fish or seafood whether whole, dressed or fresh frozen for sale to the consumer only.	
81	<i>Wholesale Dealer</i>	50.00
	Persons or firms purchasing fresh or fresh frozen fish or seafood for resale to dealers or to ship out of state.	
82	<i>Wholesale Dealer's Agent</i>	10.00

Persons purchasing for Wholesale Dealer.

(Must be obtained by Dealer)

- 83 *Salt Water Shrimp Freighter*
(Vessel affidavit required with application)

Vessel 40 ft. or less	5.00
Vessel over 40 ft.	10.00
Required for any Vessel used in buying, freighting or transporting salt water shrimp.	

- 84 *Salt Water Shrimp Trawl—Vessel*
(Vessel affidavit required with Commercial applications for registered boats and documented Vessels)

Trawls 16 ft. or less	10.00
Trawl 16-40 ft.	15.00
Trawl over 40 ft.	20.00
Vessel 40 ft. or less	5.00
Vessel over 40 ft.	10.00

Vessel license *Class 77* may be substituted for this vessel license.

A license fee must be paid on each separate trawl when a double rig is used.

Sportsmen: (Non-commercial Trawling)

No Vessel license required. No license required for trawl 16 ft. or less. (Max. 100 lbs. per boat daily)

- 85 *Non-Resident Shrimp Trawl—Vessel*
(Same as *Class 84*) Vessel license *Class 78* may be substituted for this Vessel license.

- 86 *Non-Resident Minnow Dealer* 200.00
Required of all non-residents wholesaling minnows within the state.

- 87 *Resident Fish Farmer* 10.00
Pond raised fish or bait species for sale.

IMPORTANT: The details furnished are in abbreviated form and are intended to assist the applicant. Licenses are accepted under all terms and conditions as provided by law.

Fishing—General Provisions

FRESH WATER GAME FISH (NO STATEWIDE CLOSED SEASON)

<i>Kinds</i>	<i>Creel Limits</i>
Black bass ("green trout")	15 daily
Yellow bass ("striped bass")	25 daily
White bass ("bar fish")	25 daily
Crappie ("white perch," "speckled perch," "sac-a-lait")	50 daily
Sunfish ("perch," "bream," "goggle-eye," "bluegill," etc.)	100 daily

Possession Limits: Not more than two (2) days' creel limit of any kind of game fish may be possessed.

Sale Prohibited: No fresh water game fish may

be sold in the State, whether caught within or without the State of Louisiana.

Bait Seines, 30 feet or less, dip nets and minnow traps are permitted in fresh water when used for the sole and only purpose of taking minnows, shrimp, and other permitted baits.

FRESH WATER COMMERCIAL FISH

<i>Kind</i>	<i>Size Limits</i>
Buffalofish	16 inches minimum length
Gaspergou	12 inches minimum length
Paddlefish (Spoon-bill Cat)	15 pounds or more
Common Bullfrogs (<i>Rena catesbeiana</i>)	5½ inches or more
Southern Bullfrogs (<i>Rena grylio</i>), also called lagoon frogs or grunthers	3½ inches or more
Catfish (Blue Cat or Mississippi Cat; Channel Cat or White Cat; Yellow Cat or Opelousas Cat or Goujon, Eel Cat or Wil-low Cat)	14 inches minimum length

A licensed commercial fisherman may take in any one day 25 catfish under the legal size limit for home consumption only. Commercial fishermen must return all other undersized fish to waters without injury.

Any commercial species upon which there is no specified size limit may be taken in any size or quantity.

Persons fishing exclusively for home consumption, but not for sale, are permitted to take or have in possession in one day a total of twenty-five specimens in the aggregate of buffalofish and catfish, under legal size.

Frogs: Closed season on taking of Bullfrogs and Lagoon Frogs each year during the month of April and May. Frogs may be taken with the aid of a jack light or any other visible light and by means of mechanical devices known as frogs catchers, provided these do not puncture the skin or redden the meat of the frog. The taking of frogs by means of spears or other devices which puncture the skin or redden the meat of the frog is especially prohibited. It is unlawful for any person to carry or have in his possession any shotgun, rifle or firearms while taking or hunting frogs during the night time.

SALT WATER FISH

<i>Kinds</i>	<i>Commercial Size Limits</i>
Speckled Sea Trout	10 inches minimum length
Redfish	16 inches minimum length
Sheepshead	10 inches minimum length
Hard Shell Crabs	5 inches in width
Soft Shell Crabs	4½ inches in width
Diamond-back Terrapin	6 inches in length

No size limits on species not listed.

Commercial fishermen must return all undersized fish to the waters from which taken without avoidable injury.

Commercial size limits on Speckled Sea Trout, Redfish and Sheepshead shall not apply to these

species when taken by persons fishing exclusively for home consumption, and not for sale or exchange.

Bait Seines: Seines measuring less than 100 feet, trawls measuring 16 feet or less, cast nets, dip nets, bait traps, (not Butterfly nets) or other devices approved by the Department may be used in coastal waters for the sole purpose of taking minnows, shrimp or other bait permitted by law.

Diamond-back Terrapins: Traps of any kind are prohibited. Shipping prohibited between the fifteenth day of April and the fifteenth day of June. Terrapin caught during that period must be returned to the water alive unless retained at terrapin farms, and no person shall take the eggs of any species of turtle except the mobile turtle wherever found.

Crabs: Taking adult female crabs in the so-called berry stage (or with eggs attached) is strictly prohibited, and if caught must be returned to the waters alive. It is illegal to trawl for crabs. However, the holder of a shrimp seine or trawl license may retain any legal crabs that happen to be caught while trawling or seining for shrimp.

Methods of Taking Fresh or Salt Water Game Fish: A person may take fresh or salt water game fish only by means of rod (or fishing pole), hook and line, trolling line, hand line, bait casting, fly casting apparatus and by use of the device known as a "yo-yo." No person shall take these fish by means of spears, poisons, stupefying substances, explosives, guns, bows and arrows, or traps (including lead nets and tree-topping devices) except a barbless spear used in salt water for taking flounders. Garfish may be taken by means of spears, guns, bows and arrows, or traps. Tree-topping and other identical or similar devices for trapping fish, as well as other methods and devices set out in the preceding sentence of this Section are illegal and a violation of this Section. No person shall take these fish by means of artificially or electrically controlled or operated devices mechanically or manually operated with or without explosives. It shall be unlawful to possess any of the prohibited instruments, weapons, substances or devices set out hereinabove, with the intent of illegally taking fresh or salt water game fish.

Methods of Taking Commercial Fish: Commercial fish may be taken with any pole and line or the device known as a yo-yo, or hand line; or with any trot line wherein hooks are not less than twenty-four inches apart. No person shall take these fish, with exception of garfish, by means of spears, poisons, stupefying substances, explosives, guns, bows and arrows or traps (including lead nets and tree-topping devices), except a barbless spear used in salt water for taking flounder and any skin diver operating for sport in any salt water or fresh water for taking fish, when submerged in the water and using standard under-

water spearing equipment. Garfish may be taken by means of spears, guns, bows and arrows, or traps. Tree-topping and other similar devices for trapping fish, as well as other methods and devices set out in the preceding sentence of this Section are illegal and a violation of this Section. No person shall take these fish by means of artificially or electrically controlled or operated devices mechanically or manually operated with or without explosives. It shall be unlawful to possess any of the prohibited instruments, weapons, substances or devices set out hereinabove with the intent to take fish in violation of the provisions of this section.

In addition to the penalties provided elsewhere in this Subpart, any person who violates the provisions of this Section shall be penalized by the revocation of his commercial license for one year, and all equipment, including any boat or motor, used in connection with such violation shall be confiscated.

Obstruction of Streams or Lakes by Fyke Nets or Other Devices: No person shall obstruct the free passage of fish in any of the streams, lakes, bayous, or in any body of water, including trenasses, coulees, canals in marsh and swamp areas of the state by any means whatsoever. No obstructions including fyke nets, wings or leaders, seines, gill nets, or trammel nets, shall be set within five hundred feet of the mouth of any inlet or pass. Wings and leaders are permitted on hoop nets in overflowed regions where the water is out of the actual bed of the natural stream or lake. Free passageway for fish means a minimum passage way opening of five feet in width extending from the surface to the bottom of the water in the deepest portion of the water. The use of wings and leaders on nets and seines is a violation of this Section.

Pollution of Water Prohibited: No industrial or other wastes permitted in streams when such substances kill fish, or their food, or are otherwise detrimental to the interest of this State.

Tagging: All shipments must be plainly marked showing the names of consignor and consignee, and number of pounds of each species contained therein. All netting used for the taking of salt water or fresh water commercial fish must be tagged with tags furnished by the Louisiana Wild Life and Fisheries Commission and failure to have the net so tagged shall be prima facie evidence of illegal use of said tackle or netting.

WOOD BASKET OR SLAT TRAPS—ILLEGAL

The use of wood basket or slat traps as specified by Act 316 of the Regular Session of 1960 was suspended in its entirety by Senate Concurrent Resolution No. 11 adopted at the 1961 Session of the La. Legislature until further action of the Legislature.

No person shall use any seines, nets, webbing,

wood baskets, slat traps, or cans in Lake des Allemands, Bayou des Allemands and Lake Salvador.

Minimum Mesh Requirements

1. *Fresh Water Seines and Hoop Nets:*
 - (a) That portion of Avoyelles, Catahoula, and Pointe Coupee, South of the Parish of Rapides, within the natural banks, but not tributaries of the Red River, Mississippi River and Atchafalaya River, and in that portion of the Atchafalaya River Basin Area that is bounded on the North by U. S. Highway 190, on the East by the Mississippi River and Bayou Lafourche to the Gulf of Mexico, on the South by the Gulf of Mexico, and on the West by the West Atchafalaya Basin Protection Levee, and including all of Assumption, St. Mary, St. Martin and Iberville parishes; one (1") inch square or two (2") inches stretched.
 - (b) Remainder of State; Two (2") inches square or four (4") inches stretched.
2. *Fresh Water Gill Nets and Trammel Nets:* Three (3") inches square or six (6") inches stretched.
3. *Fresh Water Bait Seine:* Thirty feet or less in length, one-fourth ($\frac{1}{4}$ ") inch square or one-half ($\frac{1}{2}$ ") inch stretched.
4. *Salt Water Seines:* Seven-eighths ($\frac{7}{8}$ ") inch square or one and three-fourth ($1\frac{3}{4}$ ") inches stretched.
5. *Salt Water Trammel Nets:* One (1") inch square or two (2") inches stretched.
6. *Shrimp Seines or Shrimp Trawls:* Three-fourths ($\frac{3}{4}$ ") inch square or one and one-half ($1\frac{1}{2}$ ") inches stretched.

GAME MANAGEMENT AREAS SCHEDULE

For all Game Management Areas, except as otherwise specified:

DEER: 5 days of deer hunting as follows: November 27-December 1, either sex until the designated number of deer are taken, after which the remaining days of the total 5 days, if any, shall be open to "Bucks Only" hunting. Notification of type hunt to be made when daily permit obtained.

PERMITS: When daily permits are required these may be obtained at the permit station located on or near the Game Management Areas.

Season permits, where required, may be obtained in advance beginning September 1 from any Commission District Office: P. O. Box 915, Minden; P. O. Box 4004, Ouachita Station, Monroe; P. O. Box 278, Tioga; P. O. Box 426, Ferriday; P. O. Box 405, DeRidder; P. O. Box 585, Opelousas; P. O. Box 14526, Southeast Station, Baton Rouge. Turkey Season permits obtained at District Offices listed above beginning March 1, 1965.

EVANGELINE:

Deer: 125 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit.

Quail: December 5-9; February 6-14; Season Permit.

CATAHOULA:

Deer: 350 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31. Season Permit.

CALDWELL:

Deer: Bucks only; Daily Permit.
Squirrel and Rabbit: October 3-31. Season Permit.

CHICAGO MILL:

Deer: Bucks only; Daily Permit.
Squirrel and Rabbit: October 3-31. Season Permit.
Turkey: April 3-18. Special Turkey Season Permit required, available from District Offices after March 1, 1965.

WEST BAY:

Deer: One day 11-17-64 any deer only on specified and marked portion of area. Four days bucks only. Old original GMA marked and closed to all deer hunting. Daily permit.
Squirrel and Rabbit: October 3-31; Season Permit.
Quail: December 5-9; February 6-14; Season Permit.

FORT POLK:

Deer: 300 Any Deer and 3 days; November 27-29; Daily Permit.
Deer: Concurrent with adjacent areas— legal bucks only. *Season Permit.
All small game—all statewide seasons applicable.
The use of dogs prohibited during deer seasons.
*Military clearance possibly required in addition to Season Permit—Check locally.

JACKSON-BIENVILLE:

Deer: 400 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit.
Quail: December 5-9; Feb. 6-14; Season Permit.

UNION:

Deer: 100 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit.

EAST CARROLL:

Deer: Bucks only; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit.

RUSSELL SAGE:

Deer: Same as outside with Season Permit except 1 day (Nov. 27) any deer with Daily Permit.

All small game same as outside but still hunt only. Season Permit.

No permanent duck blinds.

BODCAU:

Deer: Same as outside except still hunt only 1 day (Nov. 27) any deer; Season permit.

All small game same as outside but still hunt only; Season permit.

Dogs allowed only for bird hunting.

No permanent duck blinds.

SABINE:

Deer 100 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit.

RED DIRT:

Deer: 250 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit.

Quail: December 5-9; Feb. 6-14; Season Permit.

THISTLETHWAITE:

Deer hunting prohibited.

Squirrel and Rabbit: October 3-18; November 7-15; mornings only until 12 noon. Daily Permit.

LUTCHER-MOORE:

Deer hunting prohibited.

All small game—all statewide seasons applicable—the use of dogs permitted only for quail hunting; Season Permit.

CONCORDIA:

Deer hunting prohibited.

Squirrel and rabbit: October 3—November 26; Season Permit.

ALEXANDER STATE FOREST:

Deer: 80 Any Deer and 5 days; Daily Permit.
Squirrel and Rabbit: October 3-31; Season Permit. Check locally for restricted areas.

ZEMURRAY PARK:

Deer: December 2, 3, and 4. Any Deer. 200 hunters per day. Non-transferable permits are to be issued by mail in advance of hunts. Resident hunters only to be selected at public drawing in New Orleans on Tuesday, November 17. Applicants do not have to be present. Post card applications must be made by United States mail only to Fish and Game Division, Louisiana Wild Life and Fisheries Commission, 400 Royal Street, New Orleans, Louisiana 70130, being postmarked between Thursday, October 15, and Saturday, November 14, and received at the above address no later than Monday, November 16. Hunter's failure to include big game license number will void his application. Only one application will be considered. State choice with one (1) alternate date for one (1) of three designated days. More than one name per application will automatically void such application. Duplicate applications by any hunter will cancel

all his applications. No small game hunting permitted.

SODA LAKE:

Waterfowl hunting permitted Monday, Wednesday and Saturday mornings only (until 12 noon) throughout waterfowl season. Season Permit.

Small game seasons open during statewide season EXCEPT no hunting allowed during the closed portions of waterfowl seasons.

No permanent duck blinds.

SALINE WILDLIFE MANAGEMENT AREA:

New Area (recently purchased)—CLOSED due to work on area for improvement of habitat, construction on area, removal of camps, and wildlife build-up. No hunting of any kind will be permitted on this area during the 1964-1965 season.

Bear and Turkey Schedule

BEAR: December 26-30, inclusive. East Carroll and Madison Parishes: East of Bayou Macon from the Arkansas line to U. S. Hwy. 80 and north of U. S. Hwy. 80 from Bayou Macon to the Mississippi River.

St. Mary, Iberia and Vermilion Parishes: East of Vermilion River from Vermilion Bay to La. Hwy. 14, south of La. Hwy. 14 and U. S. Hwy. 90 from Vermilion River to the Atchafalaya River, and west of the Atchafalaya River from U. S. Hwy. 90 to Atchafalaya Bay.

Bay limit 1 per season. The killing of cub bear is prohibited.

TURKEY: April 3-18, 1965, inclusive. Bag 1 gobbler per season. May be taken by still hunting only; the use of dogs and baiting being specifically prohibited. Open only in the following areas:

AREA NO. A—Union and Morehouse Parishes. East of La. Hwy. 549 from Arkansas line to La. Hwy. 348 at Conway; North of La. Hwys. 348 and 33 from Conway to Marion: east of La. Hwys. 143 and 2 from Marion to Ouachita River; west of Ouachita River from La. Hwy. 2 to the intersection of Parish Road and Ouachita River (south of Papaw Lake); north of Parish Road and La. Hwy. 592 from Ouachita River to U. S. Hwy. 165; north of U. S. Hwy. 165 from La. Hwy. 592 to La. Hwy. 139; west of La. Hwys. 139 and 140 from Bastrop to Bonita; west of U. S. Hwy. 165 from Bonita to Arkansas line; Except the Union Parish Game Management Area and Terzia Refuge which are closed.

AREA NO. B—Madison, Franklin, Catahoula, Concordia and Tensas Parishes. South of U. S. Hwy. 80 from the Mississippi River to La. Hwy. 17. East of La. Hwys. 17 and 15 from Delhi to Winnsboro to Clayton; east and north

of U. S. Hwy. 65 from Clayton to the Mississippi River.

AREA NO. C—East Feliciana, East Baton Rouge, Livingston, St. Helena, and Tangipahoa Parishes. East of Thompson Creek from the Mississippi line to La. Hwy. 10; north of La. Hwy. 10 from Thompson Creek to Clinton; east of La. Hwy. 67 from Clinton to the junction of U. S. Hwy. 190 at Baton Rouge; north of U. S. Hwy. 190 from La. Hwy. 67 to the Amite River; east of Amite River from U. S. Hwy. 190 to Lake Maurepas; north of Lake Maurepas from Amite River to U. S. Hwy. 51; and west of U. S. Hwy. 51 from Lake Maurepas to the Mississippi State Line.

AREA NO. D—Washington and St. Tammany Parishes. East of La. Hwy. 25 from the Mississippi State line to Covington; east and north of U. S. Hwy. 190 from Covington to the junction of U. S. Hwy. 90; and north of U. S. Hwy. 90 from the junction with U. S. Hwy. 190 to the Mississippi State Line.

1965-66

HUNTING, FISHING AND TRAPPING REGULATIONS

Conservation laws are not designed by the state or federal government to deprive people from taking our natural resources. These regulations are necessary for the proper management of our fur, game and fish in order to assure the trapper, hunter and fisherman a never ending supply of these valuable resources. Your cooperation is necessary for the success of this conservation program.

1965-66 Hunting Seasons

RESIDENT GAME BIRDS AND ANIMALS

(Shooting Hours—one-half hour before sunrise to sunset)

QUAIL: November 25—February 15; Daily Bag 10; Possession 20.

RABBIT: October 2—January 15; Daily Bag 8; Possession 16.

SQUIRREL: October 2—January 10; Daily Bag 8; Possession 16.

BEAR: Closed

TURKEY: April 2—April 17; Daily Bag 1, Gobblers only; Season Limit 1. See schedule and map, page 10.

DEER: See Deer Hunting Schedule.

ARCHERY SEASON: October 9—November 21, 1965, Inclusive (See Deer Hunting Schedule)

COMMERCIAL HUNTING PRESERVES: October 1—March 31, Pen-raised birds only.

1965-66 Migratory Regulations

DOVES: 3 way split: September 4—September

14, 11 days; October 9—November 7, 30 days; December 18—January 15, 29 days; Bag Limit 12; Possession 24.

DUCKS: December 1—January 9. Daily bag limit 4, possession 8. Limit may not include more than 1 mallard daily or 2 possession; 1 pintail daily or 2 possession; 2 wood ducks daily or possession; 2 canvasbacks daily or possession.

BONUS DUCKS—Additional to above limits Scaup—(bluebill, dos gris); South of U. S. Hwy. 190 only; daily bag limit 2, possession 4. American, redbreasted and hooded merganizers; Daily bag limit 5, possession 10 in the aggregate of these species. Limit may not include more than 1 hooded merganser daily or 2 possession.

TEAL: Experimental Season, September 18—September 26. Daily bag limit 4, possession 8, Blue-Winged and Green-Winged Teal only. Each hunter must have in possession while hunting:

1. Special teal hunting permit (application deadline August 15).
2. Basic hunting license or State hunting permit except persons under 16 years of age.
3. Federal duck stamp except persons under 16 years of age.

COOTS: December 1—January 9. Daily bag limit 10, possession 20.

GEESE: November 6—January 14. Daily bag and possession limits 5. Limit may not include more than 2 White fronted geese (Speckle-bellies). Closed season on Canada Geese.

RAILS AND GALLINULES: October 9—December 17; Bag limit 15; Possession 30. Singly or in the aggregate of all species.

WOODCOCK: December 11—January 29; Bag limit 5; Possession 10.

SNIPES (Wilson's): November 27—January 15; Bag Limit 8; Possession 16.

SHOOTING HOURS:

1. Doves: 12:00 noon to sunset.
2. Ducks, Coots, Geese, Rails, Gallinules, Snipe and Woodcock; sunrise to sunset.

Use of bait and live decoys prohibited. Hunters of ducks and geese who have reached their 16th birthday must have a federal waterfowl stamp attached to required state hunting license or permit. A federal waterfowl stamp may be obtained from any U. S. Postoffice. Use of rifles, or shotguns larger than 10 gauge or capable of holding more than three shells prohibited. The plug used in guns must be incapable of being removed without disassembling gun. No persons shall kill or cripple any migratory game bird without making a reasonable effort to retrieve the bird and include it in his daily bag limit. Legal possession limits of game birds or game animals may be possessed up to within 30 days of the opening of the following season.

Permanent Closed Season—Swan, Whooping and Sandhill Cranes, Kildeer, Prairie Chickens, Upland Plover, or Papabotte, Black Bellied and Golden Plover or any other shore birds (except Woodcock, and Wilson's or Jacksnipe), have no open season for hunting.

GROSBEK (Night Heron)—It is against Federal and State laws to kill Grosbecks or any other kind of Herons, Egrets or Cranes at any time.

OUTLAW BIRDS—Cormorants (nigger geese), vultures (buzzards), great horned owls, duck hawks, sharp-shinned and cooper hawks (blue darters), crows, red-winged black birds (rice birds), English sparrows, starlings and, when destructive to crops, grackles (chocks) and bob-o-links (true rice birds).

OUTLAW QUADRUPEDS—Wolves, foxes, wildcats (bobcats or catamounts), cougars (panthers).

1965-66 Deer Hunting Schedule

A. Bag: One legal deer per day; 3 Legal deer per season.

B. Legal buck is defined as a deer with antlers not less than three inches in length. The killing of bucks with antlers less than three inches and doe deer is prohibited except where specifically permitted.

C. Deer hunting restricted to legal bucks only, except where otherwise specifically permitted.

D. Either sex deer, or any deer, is defined as any male or female deer, except spotted fawns which are protected, taken in any area designated and regulated as such.

E. Still Hunting Only prohibits the use of dogs for hunting or the training of dogs in areas so designated, including game management or refuge areas. In all other areas, deer hunting will be permitted with or without the use of dogs.

F. All areas not specifically designated as being open are hereby closed.

G. Archery season: October 9-November 21, 1965.

The taking of deer permitted in all areas declared open for deer hunting, including all game management areas except the following: Saline, Zemurray, Thistlewaite and Concordia. The West Bay Game Management Area is opened for bucks only.* Either sex deer may be taken in all open areas except in Allen, East Carroll, East Feliciana, Evangeline, Madison, Iberville, Lincoln, St. Helena, Tensas, Vernon, Webster and Winn Parishes. Permits required for hunting on game management areas. For details see provisions under game management area schedule. Special bow and arrow regulations: Arrows used for hunting deer

shall have well sharpened metal broadhead blades not less than 7/8 in width.

The following shall be unlawful:

1. To have in possession any gun while hunting with bow and arrow during the special bow and arrow deer season.

2. To have in possession, or under control while hunting, any poisoned arrows, arrows with explosive tips, or any bow drawn, held or released by mechanical means.

3. To hunt deer with a bow having a pull less than 30 pounds.

DESCRIPTION OF AREAS

41 days with or without Dogs: November 26—December 12; December 18—January 10.

Area No. 1: Avoyelles, Pointe Coupee, St. Landry, East Baton Rouge, West Baton Rouge, West Feliciana, Iberville, St. Martin, Lafayette, Iberia, Ascension, Assumption, St. Mary, Vermilion, St. James, Terrebonne, Lafourche, St. Charles, St. John, Livingston, Tangipahoa, Jefferson, St. Bernard, Plaquemines, Orleans and St. Tammany Parishes.

South of La. Hwy. 14 from Cameron-Vermilion Parish line to New Iberia, east of U. S. Hwy. 90 from New Iberia to Lafayette, east of U. S. Hwy. 167 from Lafayette to Opelousas, south of U. S. Hwy. 190 from Opelousas to junction of U. S. Hwy. 71, east of U. S. Hwy. 71 from U. S. Hwy. 190 to Bunkie, south and east of La. Hwy. 115 from Bunkie to Marksville to Big Creek, South and west of Big Creek from La. Hwy. 115 to Red River, South and west of Red River from Big Creek to Lower Old River, South of Lower Old River from Red River to the Mississippi River, West of the Mississippi River from Old River to La. Hwy. 22 (Ascension Parish), South of La. Hwy. 22 from Mississippi River to Sorrento to Springfield to the Tchefuncte River, West of the Tchefuncte River from La. Hwy. 22 to Lake Pontchartrain, West and south of Lake Pontchartrain to Lake Borgne, South and east of Lake Borgne to the Mississippi Sound. Included is Profit Island in East Baton Rouge Parish. EXCEPT: That area designated as No. 13 which is Still Hunting Only.

33 Days with or without Dogs*: November 26—December 12, December 18—January 2.

Area No. 2: Morehouse, East Carroll, Madison, West Carroll, Tensas, Franklin, Richland, Catahoula, Concordia, Rapides, Grant, Winn, LaSalle, Jackson, Caldwell, Bienville, Natchitoches, and West Feliciana Parishes.

East of the Ouachita River from the Arkansas State line to La. Hwy. 2 at Sterlington, North

*On October 26, the commission voted to change the Any Deer archery season in progress on the East Carroll Game Management Area to a Bucks only season.

*Either sex deer shall be legal during the first 3 days of the open season in Ward 2 of Tensas Parish.

of La. Hwy. 2 to junction of U. S. Hwy. 165, East of U. S. Hwy. 165 to junction of La. Hwy. 134, North of La. Hwy. 134 from U. S. Hwy. 165 to Little Bayou Bouef, East of Little Bayou Bouef to Lafourche drainage canal, North of Lafourche drainage canal (Irvin Lake) to Gum Ridge Road, West of Gum Ridge Road from Lafourche drainage canal to La. Hwy. 134, North of La. Hwy. 134 from Gum Ridge Road to Bouef River, North and West of Bouef River from La. Hwy. 134 to La. Hwy. 588, North of La. Hwy. 588 from Bouef River to Pioneer, East of La. Hwy. 17 from Pioneer to Winnsboro, East and South of La. Hwy. 15, Deer Creek, Bouef and Ouachita Rivers from Winnsboro to Jonesville, South and East of U. S. Hwy. 84 from Jonesville to junction of La. Hwy. 28, South and East of La. Hwy. 28 from U. S. Hwy. 84 to Saline Bayou, South and West of Saline Bayou and Little River from La. Hwy. 28 to U. S. Hwy. 165, North and West of U. S. Hwy. 165 to La. Hwy. 127, South and West of La. Hwy. 127 to La. Hwy. 126, North of La. Hwy. 126 from La. Hwy. 127 to Parish Road, West of Parish Road from La. Hwy. 126 to Vixen, South of La. Hwy. 4 from Vixen to Jonesboro to Dugdemona Bayou, East of Dugdemona from La. Hwy. 4 to La. Hwy. 126, South of La. Hwy. 126 from Dugdemona Bayou to La. Hwy. 9, West of La. Hwy. 9 from La. Hwy. 126 to La. Hwy. 155 at Saline, South of La. Hwy. 155 from Saline to Black Lake Bayou, East of Black Lake Bayou and Saline Bayou (Black Lake and Clear Lake) from La. Hwy. 155 to Red River, East of Red River from Saline Bayou to Rapides-Avoyelles Parish line, West of Rapides-Avoyelles Parish line to Big Creek, North of Big Creek from Rapides-Avoyelles Parish line to Big Saline Bayou, North and East of Big Saline Bayou from Big Creek to Red River, North and East of Red River from Big Saline Bayou to Lower Old River, North of Lower Old River from Red River to the Mississippi River, West of the Mississippi River to the Arkansas State Line, South of the Arkansas State Line to the Ouachita River.

Area No. 3: Rapides, Beauregard, Allen, Evangeline, St. Landry, Vernon, and Avoyelles Parishes.

South and East of La. Hwys. 28, 112, and 113 from Alexandria to Union Hill through Pitkin to Sugartown to U. S. Hwy. 171, East of U. S. Hwy. 171 from La. Hwy. 112 to Ragley; North of U. S. Hwy. 190 from Ragley to Opelousas; West of U. S. Hwy. 167 from Opelousas to Ville Platte; West of La. Hwy. 29 from Ville Platte to Bunkie; West of U. S. Hwy. 71 from Bunkie to Alexandria.

Area No. 4: Beauregard and Calcasieu Parishes.

South of Anacoco Bayou, West of La. Hwy. 111 and South of U. S. Hwy. 190 from the Texas Line to DeRidder; West of La. Hwy. 27 from DeRidder to Sulphur and North of U. S. Hwy. 90 from Sulphur to the Texas Line.

Area No. 5: Sabine, DeSoto, and Vernon Parishes.

South of U. S. Hwy. 84 from Texas Line to Logansport to Mansfield; West of U. S. Hwy. 171 from Mansfield to Leesville; North of La. Hwy. 8 from Leesville to Burr Ferry to Texas Line.

Area No. 6: Natchitoches and Red River Parishes.

South of La. Hwy. 174 from Ajax to La. Hwy. 1; East of La. Hwy. 1 to U. S. Hwy. 84 at Armstead; South and West of U. S. Hwy. 84 and U. S. Hwy. 71, from Armstead to Clarence; North and West of La. Hwy. 6 from Clarence to Natchitoches; West of La. Hwy. 1 from Natchitoches to Derry; West of La. Hwy. 119 from Derry to Gorum; North and West of the Kisatchie-Mink-Gorum Road (La. Hwy. 118) to Kisatchie East of La. Hwy. 117 from Kisatchie to Vowell's Mill Road; North and East of Vowell's Mill Road (La. Hwy. 478) to Robeline; North and East of La. Hwy. 120 to La. Hwy. 1221, east of La. Hwy. 1221 to La. Hwy. 174, south of La. Hwy. 174 to Ajax.

21 Days, With or Without Dogs; Nov. 26—Dec. 5; Dec. 18—Dec. 28.

Area No. 7: Caddo, Bossier, Webster, Claiborne, Union, DeSoto, Red River, Bienville, Lincoln, Jackson, Ouachita, Richland, Morehouse, Caldwell, Franklin, Catahoula, LaSalle, Winn, Sabine, Natchitoches, Vernon.

South of the Arkansas State line from the Texas State line to the Ouachita River, west of the Ouachita River from the Arkansas State line to Sterlington, south of La. Hwy. 2 from Sterlington to U. S. Hwy. 165; West of U. S. Hwy. 165 to junction of La. Hwy. 134, south of La. Hwy. 134 from U. S. Hwy. 165 to Little Bouef Bayou, west of Little Bouef Bayou from La. Hwy. 134 to Lafourche drainage canal, south of Lafourche drainage canal to Gum Ridge Road east of Gum Ridge Road to La. Hwy. 134, south of La. Hwy. 134 from Gum Ridge Road to junction of La. Hwy. 183, west of La. Hwy. 183 to U. S. Hwy. 80 at Holly Ridge, north of U. S. Hwy. 80 from Holly Ridge to Rayville, west of La. Hwy. 137 from Rayville to Archibald, west of La. Hwy. 15 from Archibald to Deer Creek, west of Deer Creek and Ouachita River to Jonesville, north of U. S. Hwy. 84 from Jonesville to Jena, north of La. Hwy. 772 and La. Hwy. 8 from Jena to Little River, east of Little River to the junction of U. S. Hwy.

165, east of U. S. Hwy. 165 from Little River to junction to La. Hwy. 127, north of La. Hwy. 127 to junction to La. Hwy. 126, south and east of La. Hwy. 126 to Parish Road from Chester to Vixen, north of La. Hwy. 4 from Vixen to Jonesboro to Dugdemona Creek west of Dugdemona Creek from La. Hwy. 4 to La. Hwy. 126, north of La. Hwy. 126 from Dugdemona Creek to La. Hwy. 9, east of La. Hwy. 9 from La. Hwy. 126 to La. Hwy. 155 at Saline, north of La. Hwy. 155 from Saline to Black Lake Bayou, west of Black Lake Bayou, and Black Lake from La. Hwy. 155 to La. Hwy. 9, North of La. Hwy. 9 from Black Lake to U. S. Hwy. 84, north of U. S. Hwy. 84 from La. Hwy. 9 to La. Hwy. 1 at Armstead, west of La. Hwy. 1 from Armstead to Lake End, north of La. Hwy. 174 from Lake End to the junction of La. Hwy. 1221, west of La. Hwy. 1221 from La. Hwy. 174 to junction of La. Hwy. 120, south and west La. Hwy. 120 from La. Hwy. 1221 to Robeline, west of La. Hwy. 478 (Vowell's Mill Road) from Robeline to La. Hwy. 117, west of La. Hwy. 117 from La. Hwy. 478 to U. S. Hwy. 171 at Leesville, east of U. S. Hwy. 171 from Leesville to U. S. Hwy. 84 at Mansfield, north of U. S. Hwy. 84 from Mansfield to the Texas State line, east of the Texas State line from U. S. Hwy. 84 to the Arkansas State line; Barksdale Air Force Base shall be open for either sex still hunting only for 20 days. Dec. 10-19; Dec. 31-Jan. 9, 1966. EXCEPT, that portion of Caddo Parish south of U. S. Hwy. 80 from Shreveport to Greenwood, east of La. Hwy. 169 from U. S. Hwy. 80 to Spring Ridge, East of La. Hwy. 789 from Spring Ridge to Keatchie Bayou, north of Keatchie Bayou, Wallace Lake and Bayou Pierre to La. Hwy. 175 west, north of La. Hwy. 175 from Bayou Pierre to La. Hwy. 1, west of La. Hwy. 1 from La. Hwy. 175 to U. S. Hwy. 80 which shall be closed and EXCEPT that portion of Bossier Parish west of La. Hwy. 3 from Bossier City to Benton to La. Hwy. 160 at Hughes, south of La. Hwy. 160 from Hughes to Red River, east of Red River from La. Hwy. 160 to Bossier City, which shall be closed.

Area No. 8: Washington and St. Tammany Parishes.

East of La. Hwy. 450 from the Mississippi State line to La. Hwy. 10, south of La. Hwy. 10 from La. Hwy. 450 to Tchefuncte River, east of the Tchefuncte River from La. Hwy. 10 to Lake Pontchartrain, north of Lake Pontchartrain from Tchefuncte River to the Mississippi line.

Area No. 9: East Feliciana, East Baton Rouge, and St. Helena Parishes.

West of La. Hwy. 43 from Mississippi line to

junction to La. Hwy. 16, north of La. Hwy. 16 from La. Hwy. 43 to Amite River at Dennis Mills, West of Amite River from Dennis Mills to Stony Point; North of Stony Point—Burch Road from Stony Point to Fred; and East of La. Hwy. 67 from Fred to Mississippi line.

Area No. 10: West Feliciana Parish.

South of Como Bayou from Mississippi River to abandoned L & A Railroad; West of L & A Railroad from this junction to Bayou Sara; West and North of Bayou Sara from abandoned Railroad to Mississippi River; North and East of Mississippi River from Bayou Sara to Como Bayou.

4 Days, With or Without Dogs; Nov. 26—Nov. 29.

Area No. 11: Ascension, East Baton Rouge, and Livingston Parishes.

East of U. S. Hwy. 61 from U. S. Hwy 190 to La. Hwy. 42, North of La. Hwy. 42 from U. S. Hwy. 61 to La. Hwy. 447 at Port Vincent, West of La. Hwy. 447 from Port Vincent to U. S. Hwy. 190 at Walker, South of U. S. Hwy. 190 from Walker to U. S. Hwy. 61.

21 Days, Still Hunting Only; Nov. 26—Dec. 5; Dec. 18—Dec. 28.

Area No. 12: Natchitoches, Vernon, Beauregard, Calcasieu, Jefferson Davis, Allen, Rapides, and Avoyelles Parishes.

East of La. Hwys. 6, 1, and 119. from Red River to Gorum, south of Gorum, Mink, Kisatchie Road to La. Hwy. 117, east of La. Hwy. 117 from Kisatchie to Leesville, south of La. Hwy. 8 from Leesville to the Sabine River, east of the Sabine River to Anacoco Bayou, north and east of Anacoco Bayou to La. Hwy. 111 and U. S. Hwy. 190 from the Sabine River to DeRidder, East of La. Hwy. 27 from DeRidder to Sulphur, north and west of U. S. Hwy. 90 and U. S. Hwy. 165 from Sulphur to Iowa to Kinder, south and west of U. S. Hwy. 190 from Kinder to Ragley to La. Hwy. 112, north and west of La. Hwy. 112, 113, and 112 from intersection of U. S. Hwy. 190 to Sugartown to Pitkin to Union Hill, to Hineston, west and north of La. Hwy. 28 from Hineston to U. S. Hwy. 71 at Alexandria, east of U. S. Hwy. 71 from Alexandria to Bunkie, north and west of La. Hwy. 115 from Bunkie to Big Creek, south of Big Creek from La. Hwy. 115 to the Rapides-Avoyelles Parish line, east of the Rapides-Avoyelles Parish line from Big Creek to Red River, west of Red River from Rapides-Avoyelles Parish line to La. Hwy. 6.

Area No. 13: St. John the Baptist Parish.

South of Pass Manchac from Lake Pontchartrain to U. S. Hwy. 51, east of U. S. Hwy. 51 from Pass Manchac to La. Hwy. 638 (Frenier

Beach Road) and north of La. Hwy. 638 from U. S. Hwy. 51 to Lake Pontchartrain, West of shore of Lake Pontchartrain from La. Hwy. 638 to Pass Manchac.

3 Days, Still Hunting Only; Nov. 26—Nov. 28.

Area No. 14: Cameron Parish.

South and east of Mermentau River from the Gulf of Mexico to Grand Lake, south of Grand Lake, Callicon Lake and Old Intracoastal Canal to the Cameron-Vermilion Parish Line, west of Cameron-Vermilion Parish line from the Old Intracoastal Canal to the Gulf of Mexico.

Hunting and Sport Fishing Licenses

HUNTING: (All Basic licenses exclude Big Game—Deer, and Turkey Hunting)

1965-66 SEASON

1. Basic Resident\$ 2.00
2. Basic Non-Resident, Season\$ 25.00
3. Basic Non-Resident, Two consecutive days\$ 5.00
4. Big Game, Resident and Non-Resident\$ 2.00
(Basic License required before this License can be issued)

HUNTING CLUB:\$ 5.00

COMMERCIAL HUNTING PRESERVE

(Pen raised birds only)\$200.00

Non-Resident Preserve Hunting, Four consecutive days\$ 5.00

(Good only on preserve where issued. This license or Basic license may be used on preserve).

Game Breeder 10.00

Raising and selling wild birds, game or fur bearers.

FISHING:

1. Resident July 1, 1965—June 30, 1967\$ 2.00
2. Non-Resident, annual July 1, 1965—June 30, 1966\$ 5.00
3. Non-Resident, Seven consecutive days\$ 2.00

EXCEPTIONS AND EXEMPTIONS—Hunting and Fishing License fees:

1. Persons in the Armed Forces of the United States, on active military duty, shall for license purposes be given resident privileges.
2. Persons under sixteen years of age, whether residents or non-residents of the state, shall not be required to obtain licenses or pay fees to fish or hunt and shall be issued a permit and tags to hunt Deer, Bear or Turkey if requested.
3. No Fishing license fee is required of a resident using a rod (or fishing pole) or hook and line, without a reel or artificial bait.

4. Any person over 60 years of age, resident of the state the two years next preceding application shall be issued free hunting and fishing permits.

5. Any Non-Resident who owns or leases a resort cottage on an annual basis and occupies such cottage for more than thirty days during the year may obtain a Basic Resident hunting license.

6. Any Non-Resident who owns property touching any well known lake or hunting club and of an assessed value of five hundred dollars or more, and who spends as much as thirty days of each year upon the property, may obtain resident fishing and hunting licenses. This does not apply if the property is in the name of a club, company, or corporation.

Trapping and Fur Licenses

TRAPPING\$ 2.00

FUR BUYER, Resident\$ 25.00

FUR BUYER, Non-Resident\$100.00

FUR DEALER, Resident (\$500 deposit required)\$150.00

NON-RESIDENT DEALER (\$1000.00 deposit required)\$300.00

FUR TAX

State severance tax on all skins or hides taken from any wild fur-bearing animal or alligator within the State must be paid to the Wild Life and Fisheries Commission by the dealer or by the trapper shipping his own catch out of the State. All packages of furs shipped within or without the State must carry official department tags.

The severance tax on skins and hides is as follows:

Muskrat 1 cent; Opossum 1 cent; Skunk 1 cent; Civet Cat 1 cent; Ring-tail Cat 1 cent; Wild Cat 1 cent; Fox 1 cent; Wolf 1 cent; Raccoon 1 cent; Mink 10 cents; Nutria or Coypu 2 cents; Otters 25 cents; Alligators, from 5 to 10 feet, 5 cents; Alligators, over 10 feet, 25 cents.

1965-66 TRAPPING SEASON

MUSKRAT AND BEAVER: December 1-February 25.

NUTRIA: November 20-February 28.

MINK: November 15-January 10.

ALL OTHER FUR BEARERS: November 15-February 15.

ALLIGATOR: Closed

CLOSED AREAS: All of St. Bernard Parish and those portions of Plaquemines Parish east of the Mississippi River bounded on the south by the Pointe-a-la-Hache boat channel.

Commercial Fishing and Dealer Licenses

CLASS

50	<i>Oyster Tonnage</i> (Minimum Fee)\$ 1.00 Vessel license based on carrying capacity. \$.50 per ton (1 ton=20 bbls.)				Vessel license 50.00 Each Seine in Use 50.00
51	<i>Oyster Dredging</i> 50.00 Vessel using scrapers, dredges or implements other than hand tongs.		80	<i>Retail Dealer—Fish & Seafood</i> 5.00 Persons or firms purchasing fish or seafood whether whole, dressed or fresh frozen for sale to the consumer only.	
52	<i>Oyster Shop & Resale</i> Wholesale oyster dealer license 10,000 bbls or 1-5 shuckers 10.00 15,000 bbls or 6-9 shuckers 15.00 20,000 bbls 20.00 Over 20,000 bbls or 10 or more shuckers 25.00		81	<i>Wholesale Dealer</i> 50.00 Persons or firms purchasing fresh or frozen fish or seafood for resale to dealers or to ship out of state.	
70	<i>Commercial Fisherman, Retail Bait Seller</i> 5.00 Required for all commercial fishing not requiring special netting licenses. Used to catch and/or sell bait species retail. <i>Retail Dealer license-class 80</i> may be used to sell bait.		82	<i>Wholesale Dealer's Agent</i> 10.00 Persons purchasing for Wholesale Dealer. (Must be obtained by Dealer)	
71	<i>Hoop Net</i> (15 Nets) 5.00		83	<i>Salt Water Shrimp Freighter</i> (Vessel affidavit required with application) Vessel 40 ft. or less 5.00 Vessel over 40 ft. 10.00 Required for any Vessel used in buying, freighting or transporting salt water shrimp.	
72	<i>Fresh Water Fish Seine</i> (100 Yards) 5.00		84	<i>Salt Water Shrimp Trawl—Vessel</i> (Vessel affidavit required with Commercial applications for registered boats and documented Vessels) Trawl 16 ft. or less 10.00 Trawl 16-40 ft. 15.00 Trawl over 40 ft. 20.00 Vessel 40 ft. or less 5.00 Vessel over 40 ft. 10.00 Vessel license <i>Class 77</i> may be substituted for this vessel license. A license fee must be paid on each separate trawl when a double rig is used.	
73	<i>Fresh Water Fish Trammel Net</i> (100 Yards) 5.00			<i>Sportsmen: (Non-commercial Trawling)</i> No Vessel license required. No license required for trawl 16 ft. or less. (Max. 100 lbs. per boat daily)	
74	<i>Fresh Water Fish Gill Net</i> (100 Yards) 5.00		85	<i>Non-Resident Shrimp Trawl—Vessel</i> (Same as Class 84) Vessel license <i>Class 78</i> may be substituted for this Vessel license.	
75	<i>Salt Water Fish or Shrimp Seine</i> Fish Seine 100-500 ft. 10.00 Fish Seine 500-2000 ft. 20.00 Fish Seine over 2000 ft. 25.00 Shrimp Seine 100 ft. or less 10.00 Shrimp Seine 100-500 ft. 15.00 Shrimp Seine 500-2000 ft. 25.00 Shrimp Seine 2000-3000 ft. 30.00		86	<i>Non-Resident Minnow Dealer</i> 200.00 Required of all non-residents wholesaling minnows within the state.	
76	<i>Salt Water Fish Trammel Net</i> (Same as Fish Seine Class 75)		87	<i>Resident Fish Farmer</i> 10.00 Pond raised fish or bait species for sale.	
77	<i>Salt Water Fish or Shrimp Vessel</i> (Vessel affidavit required with application) Vessel 40 ft. or less 5.00 Vessel over 40 ft. 10.00 This license or Vessel license obtained with <i>Class 84</i> (Shrimp Trawl-Vessel) required for registered boats and documented Vessels (except menhaden vessels) using salt water netting.				
78	<i>Non-Resident Fish or Shrimp Vessel</i> (Same as Class 77). This license or Vessel license obtained with <i>Class 85</i> required				
79	<i>Menhaden Seine-Vessel</i> (Vessel affidavit required with application)				

IMPORTANT: The details furnished are in abbreviated form and are intended to assist the applicant. Licenses are accepted under all terms and conditions as provided by law.

Fishing—General Provisions

FRESH WATER GAME FISH (NO STATEWIDE CLOSED SEASON)

<i>Kinds</i>	<i>Creel Limits</i>
Black bass ("green trout")	15 daily
Yellow bass ("striped bass")	25 daily
White bass ("bar fish")	25 daily
Crappie ("white perch," "speckled perch," "sac-a-lait")	50 daily
Sunfish ("perch," "bream," "goggle-eye," "bluegill," etc.)	100 daily

Possession Limits: Not more than two (2) days' creel limit of any kind of game fish may be possessed.

Sale Prohibited: No fresh water game fish may be sold in the State, whether caught within or without the State of Louisiana.

Bait Seines, 30 feet or less, dip nets and minnow traps are permitted in fresh water when used for the sole and only purpose of taking minnows, shrimp, and other permitted baits.

FRESH WATER COMMERCIAL FISH

<i>Kind</i>	<i>Size Limits</i>
Buffalofish	16 inches minimum length
Gaspergou	12 inches minimum length
Paddlefish (Spoon-bill Cat)	15 pounds or more
Common Bullfrogs (<i>Rena catesbeiana</i>)	5½ inches or more
Southern Bullfrogs (<i>Rena grylio</i>), also called lagoon frogs or grunthers	3½ inches or more
Catfish (Blue Cat or Mississippi Cat; Channel Cat or White Cat; Yellow Cat or Opelousas Cat or Goujon, Eel Cat or Wilow Cat)	14 inches minimum length

A licensed commercial fisherman may take in any one day 25 catfish under the legal size limit for home consumption only. Commercial fishermen must return all other undersized fish to waters without injury.

Any commercial species upon which there is no specified size limit may be taken in any size or quantity.

Persons fishing exclusively for home consumption, but not for sale, are permitted to take or have in possession in one day a total of twenty-five specimens in the aggregate of buffalofish and catfish, under legal size.

Frogs: Closed season on taking of Bullfrogs and Lagoon Frogs each year during the months of April and May. Frogs may be taken with the aid of a jack light or any other visible light and by means of mechanical devices known as frog catchers, provided these do not puncture the skin or redden the meat of the frog. The taking of frogs by means of spears or other devices which puncture the skin or redden the meat of the frog is especially prohibited. It is unlawful for any

person to carry or have in his possession any shotgun, rifle or firearms while taking or hunting frogs during the night time.

SALT WATER FISH

<i>Kinds</i>	<i>Commercial Size Limits</i>
Speckled Sea Trout	10 inches minimum length
Redfish	16 inches minimum length
Sheepshead	10 inches minimum length
Hard Shell Crabs	5 inches in width
Soft Shell Crabs	4½ inches in width
Diamond-back Terrapin	6 inches in length

No size limits on species not listed.

Commercial fishermen must return all undersized fish to the waters from which taken without avoidable injury.

Commercial size limits on Speckled Sea Trout, Redfish and Sheepshead shall not apply to these species when taken by persons fishing exclusively for home consumption, and not for sale or exchange.

Bait Seines: Seines measuring less than 100 feet, trawls measuring 16 feet or less, cast nets, dip nets, bait traps, (not Butterfly nets) or other devices approved by the Department may be used in coastal waters for the sole purpose of taking minnows, shrimp or other bait permitted by law.

Diamond-back Terrapins: Traps of any kind are prohibited. Shipping prohibited between the fifteenth day of April and the fifteenth day of June. Terrapin caught during that period must be returned to the water alive unless retained at terrapin farms, and no person shall take the eggs of any species of turtle except the mobile turtle wherever found.

Crabs: Taking adult female crabs in the so-called berry stage (or with eggs attached) is strictly prohibited, and if caught must be returned to the waters alive. It is illegal to trawl for crabs. However, the holder of a shrimp seine or trawl license may retain any legal crabs that happen to be caught while trawling or seining for shrimp.

Methods of Taking Fresh or Salt Water Game Fish: A person may take fresh or salt water game fish only by means of rod (or fishing pole), hook and line, trolling line, hand line, bait casting, fly casting apparatus and by use of the device known as a "yo-yo." No person shall take these fish by means of spears, poisons, stupefying substances, explosives, guns, bows and arrows, or traps (including lead nets and tree-topping devices) except a barbless spear used in salt water for taking flounders. Garfish may be taken by means of spears, guns, bows and arrows, or traps. Tree-topping and other identical or similar devices for trapping fish, as well as other methods and devices set out in the preceding sentence of this Section are illegal, and a violation of this Section. No person shall take these fish by means of artificially or electrically controlled or operated devices mechanically or manually operated with

or without explosives. It shall be unlawful to possess any of the prohibited instruments, weapons, substances or devices set out hereinabove, with the intent of illegally taking fresh or salt water game fish.

Methods of Taking Commercial Fish: Commercial fish may be taken with any pole and line or the device known as a yo-yo, or hand line; or with any trot line wherein hooks are not less than twenty-four inches apart. No person shall take these fish, with exception of garfish, by means of spears, poisons, stupefying substances, explosives, guns, bows and arrows or traps (including lead nets and tree-topping devices), except a barbless spear used in salt water for taking flounder and any skin diver operating for sport in any salt water or fresh water for taking fish, when submerged in the water and using standard underwater spearing equipment. Garfish may be taken by means of spears, guns, bows and arrows, or traps. Tree-topping and other similar devices for trapping fish, as well as other methods and devices set out in the preceding sentence of this Section are illegal and a violation of this Section. No person shall take these fish by means of artificially or electrically controlled or operated devices mechanically or manually operated with or without explosives. It shall be unlawful to possess any of the prohibited instruments, weapons, substances or devices set out hereinabove with the intent to take fish in violation of the provisions of this section.

In addition to the penalties provided elsewhere in this Subpart, any person who violates the provisions of this Section shall be penalized by the revocation of his commercial license for one year, and all equipment, including any boat and motor, used in connection with such violation shall be confiscated.

Obstruction of Streams or Lakes by Fyke Nets or Other Devices: No person shall obstruct the free passage of fish in any of the streams, lakes, bayous, or in any body of water, including trenasses, coulees, canals in marsh and swamp areas of the state by any means whatsoever. No obstructions including fyke nets, wings or leaders, seines, gill nets, or trammel nets, shall be set within five hundred feet of the mouth of any inlet or pass. Wings and leaders are permitted on hoop nets in overflowed regions where the water is out of the actual bed of the natural stream or lake. Free passageway for fish means a minimum passageway opening of five feet in width extending from the surface to the bottom of the water in the deepest portion of the water. The use of wings and leaders on nets and seines is a violation of this Section.

Pollution of Water Prohibited: No industrial or other wastes permitted in streams when such substances kill fish, or their food, or are otherwise detrimental to the interest of this State.

Tagging: All shipments must be plainly marked showing the names of consignor and consignee, and number of pounds of each species contained therein. All netting used for the taking of salt water or fresh water commercial fish must be tagged with tags furnished by the Louisiana Wild Life and Fisheries Commission and failure to have the net so tagged shall be prima facie evidence of illegal use of said tackle or netting.

WOOD BASKET OR SLAT TRAPS—ILLEGAL

The use of wood basket or slat traps as specified by Act 316 of the Regular Session of 1960 was suspended in its entirety by Senate Concurrent Resolution No. 11 adopted at the 1961 Session of the La. Legislature until further action of the Legislature.

Minimum Mesh Requirements

1. *Fresh Water Seines and Hoop Nets:*

(a) That portion of Avoyelles, Catahoula, and Pointe Coupee, South of the Parish of Rapides, within the natural banks, but not tributaries of the Red River, Mississippi River and Atchafalaya River, and in that portion of the Atchafalaya River Basin Area that is bounded on the North by U. S. Highway 190, on the East by the Mississippi River and Bayou Lafourche to the Gulf of Mexico, on the South by the Gulf of Mexico, and on the West by the West Atchafalaya Basin Protection Levee, and including all of Assumption, St. Mary, St. Martin and Iberville parishes; one (1'') inch square or two (2'') inches stretched.

(b) Remainder of State: Two (2'') inches square or four (4'') inches stretched.

2. *Fresh Water Gill Nets and Trammel Nets:* Three (3'') inches square or six (6'') inches stretched.

3. *Fresh Water Bait Seine:* Thirty feet or less in length, one-fourth ($\frac{1}{4}$ '') inch square or one-half ($\frac{1}{2}$ '') inch stretched.

4. *Salt Water Seines:* Seven-eighths ($\frac{7}{8}$ '') inch square or one and three-fourths ($1\frac{3}{4}$ '') inches stretched.

5. *Salt Water Trammel Nets:* One (1'') inch square or two (2'') inches stretched.

6. *Shrimp Seines or Shrimp Trawls:* Three-fourths ($\frac{3}{4}$ '') inch square or one and one-half ($1\frac{1}{2}$ '') inches stretched.

Game Management Areas Schedule

For all Game Management Areas, except as otherwise specified:

DEER: 5 days of deer hunting unless otherwise specified: November 26-November 30, 1965 either sex until the designated number of deer are taken, after which the remaining days of the total

5 days, if any, shall be open to "bucks only" hunting. Notification of type hunt to be made when daily permit obtained.

PERMITS: When daily permits are required these may be obtained at the permit stations located on or near the Game Management areas.

Season permits, where required, may be obtained in advance beginning September 1 from any Commission District Office; P. O. Box 915, Minden; P. O. Box 4004, Ouachita Station, Monroe; P. O. Box 278, Tioga; P. O. Box 426, Ferriday; P. O. Box 405, DeRidder; P. O. Box 585, Opelousas; P. O. Box 14526, Southeast Station, Baton Rouge; 400 Royal Street, New Orleans.

Turkey Season permits obtained at District Offices listed above beginning March 1, 1966.

JACKSON-BIENVILLE:

Deer: 350 Any Deer and 5 days, November 26-30, Daily Permit. Bucks only 5 days, December 18-22, Season Permit.

Squirrel & Rabbit: October 2-31, Season Permit.

Quail: January 1-February 15, 1966. Season Permit.

BODCAU:

Deer: Same as outside except still hunt; Season Permit. All Small Game: Same as outside but still hunt only; Season Permit.

Dogs allowed only for bird hunting. No permanent duck blinds. No quail hunting on Foreign Game Bird Experimental Area, Marked Area.

SODA LAKE:

Waterfowl hunting permitted Monday, Wednesday and Saturday mornings only (until 12 noon) throughout waterfowl season. Season Permit.

Small game seasons open during statewide season EXCEPT no hunting allowed during the closed portions of waterfowl seasons. No permanent duck blinds.

CANEY:

Deer: Same as outside EXCEPT still hunt only: Season Permit.

All Small Game: Same as outside but still hunt only; Season Permit.

Dogs allowed only for bird hunting.
No permanent duck blinds.

UNION:

Deer: 100 Any Deer and 5 days: November 26-30. Daily Permit. Buck only, 5 days, December 18-22, Season Permit.

Squirrel & Rabbit: October 2-31, Season Permit.

Quail: January 1-February 15, 1966, Season Permit.

EAST CARROLL:

Deer: 5 Days, Buck Only, November 26-30, Daily Permit. 5 Days, Buck Only, December 18-22, Season Permit.

Squirrel & Rabbit: October 2-31, Season Permit.

RUSSELL SAGE:

Deer: Same as outside with Season Permit EXCEPT first Day (November 26)—Any Deer with Daily Permit.

All Small Game: Same as outside but Still Hunt Only.

GEORGIA-PACIFIC:

Deer: 5 Days, November 26-30, Bucks only; Daily Permit.

Turkey: April 2-3; 1/2 day till Noon. Daily Permit.

EVANGELINE:

Deer: 125 Any Deer and 5 Day, November 26-30, Daily Permit.

Squirrel & Rabbit: October 2-31; Season Permit.

Quail: January 1-February 15, 1966. Season Permit.

CATAHOULA:

Deer: 350 Any Deer and 5 Days, November 26-30, Daily Permit.

Squirrel & Rabbit: October 2-31; Season Permit.

Quail: January 1-February 15, 1966. Season Permit.

FORT POLK:

Deer: 300 Any Deer and 3 Days: November 26-28, Daily Permit. Legal bucks only: Concurrent with adjacent areas. Season Permit.

All Small Game: All Statewide season applicable.

The use of dogs prohibited during deer seasons.
*Military clearance possibly required in addition to Season Permit—check locally.

SABINE:

Deer: 100 Any Deer and 5 days; November 26-30; Daily Permit.

Squirrel & Rabbit: October 2-31; Season Permit.

Quail: January 1-February 15, 1966; Season Permit.

LUTCHER-MOORE:

Deer: Same as outside with Season Permit, Bucks Only.

All Small Game: All statewide seasons applicable, the use of dogs permitted for quail hunting only; Season Permit.

RED DIRT:

Deer: 250 Any Deer and 5 Days; November 26-30; Daily Permit.

Squirrel & Rabbit: October 2-31; Season Permit.

Quail: January 1-February 15, 1966; Season Permit.

ALEXANDER STATE FOREST:

Deer: 80 Any Deer and 5 Days; November 26-30; Daily Permit.

Squirrel & Rabbit: October 2-31; Season Permit, Check locally for restricted areas.

CALDWELL:

Deer: Buck only 5 days; November 26-30; Daily Permit. Bucks only, 5 Days; December 18-22; Season Permit.
Squirrel & Rabbit: October 2-31; Season Permit.

CHICAGO MILLS:

Deer: 1,200 Any Deer and 5 Days, November 26-30; Daily Permit. Bucks only, December 18-December 22; Season Permit.
Turkey: April 2-17; Special Turkey Permit required, available from District Offices after March 1, 1966.
Squirrel & Rabbit: October 2-31, Season Permit.

SALINE:

Squirrel & Rabbit: October 2-November 24; Season Permit.
All other seasons closed for development work on area.

CONCORDIA:

Squirrel & Rabbit: October 2-November 24; Season Permit.
All other seasons closed for development work on area.

WEST BAY:

Deer: Bucks Only 5 Days; November 26-30; Daily Permit.
Squirrel & Rabbit: October 2-17; Season Permit.
Quail: January 1-February 15, 1966. Season Permit.

THISTLETHWAITE:

Deer: 3 Days, Bucks Only, November 26-28 (Hogs may be killed during Deer Season).
Squirrel & Rabbit: October 2-17 and November 6-14, mornings only till 12:00 noon; Daily Permit.

ZEMURRAY PARK:

Deer: December 6, 7, and 8, Any Deer; 200 Hunters per day. Non-transferable permits are to be issued by mail in advance of hunts. Resident hunters only to be selected at public drawing in New Orleans on Tuesday, November 16. Applicants do not have to be present. Post card applications must be made by United States mail only to Fish and Game Division, Louisiana Wild Life and Fisheries Commission, Capitol Station, Baton Rouge, Louisiana, being postmarked between Thursday, October 14 and Saturday, November 13 and received at the above address no later than Monday, November 15. Hunter's failure to include big game license number will void his application. Only one application will be considered. State choice with one (1) alternate date for one (1) of three designated

days. More than two names per application will automatically void such application.

Duplicate applications by any hunter will cancel all his applications. No small game hunting permitted.

**1965-1966
Turkey Schedule**

TURKEY: April 2-17, 1966 inclusive. Bag 1 gobbler per season. May be taken by still hunting only; the use of dogs and baiting specifically prohibited.

Open only in the following areas:

Area No. A—Union and Morehouse Parishes. East of La. Hwy. 549 from Arkansas line to La. Hwy. 348 at Conway; North of La. Hwys. 348 and 33 from Conway to Marion; east of La. Hwys. 143 and 2 from Marion to Ouachita River; west of Ouachita River from La. Hwy. 2 to the intersection of Parish Road and Ouachita River (south of Papaw Lake); north of Parish Road and La. Hwy. 592 from Ouachita River to U. S. Hwy. 165; north of U. S. Hwy. 165 from La. Hwy. 592 to La. Hwy. 139; west of La. Hwys. 139 and 140 from Bastrop to Bonita; west of U. S. Hwy. 165 from Bonita to Arkansas line; Except the Union Parish Game Management Area. See Game Management Area Schedule for Georgia-Pacific Wildlife Management Area.

Area No. B—Madison, Franklin, Catahoula, Concordia and Tensas Parishes, South of U. S. Hwy. 80 from the Mississippi River to La. Hwy. 17. East of La. Hwys. 17 and 15 from Delhi to Winnsboro to Clayton; east and north of U. S. Hwy. 65 from Clayton to the Mississippi River.

Area No. C—East Feliciana, East Baton Rouge, Livingston, St. Helena, and Tangipahoa Parishes. East of Thompson Creek from the Mississippi line to La. Hwy. 10; north of La. Hwy. 10 from Thompson Creek to Clinton; east of La. Hwy. 67 from Clinton to the junction of U. S. Hwy. 190 at Baton Rouge; north of U. S. Hwy. 190 from La. Hwy. 67 to the Amite River; east of Amite River from U. S. Hwy. 190 to Lake Maurepas; north of Lake Maurepas from Amite River to U. S. Hwy. 51; and west of U. S. Hwy. 51 from Lake Maurepas to the Mississippi State Line.

Area No. D—Washington and St. Tammany Parishes. East of La. Hwy. 25 from the Mississippi State line to Covington; east and north of U. S. Hwy. 190 from Covington to the junction of U. S. Hwy. 90; and north of U. S. Hwy. 90 from the junction with U. S. Hwy. 190 to the Mississippi State Line.

Fisheries Section

HARRY E. SCHAFER
Supervisor

The Fisheries Section during the past two years received funds for carrying out its projects from three sources. First, money was allocated to the section from the Louisiana Wild Life and Fisheries Commission's annual budget. These monies support research, management, development and maintenance projects. Secondly, money was received by the section from the federal government under the Dingell-Johnson program. This money, which is derived from a federal excise tax on fishing tackle, is allocated to the states based on the number of fishing licenses sold in the state and on land area. Once again Louisiana did not receive its fair share of this federal money because of the liberal fishing license requirements. The federal monies received support our fisheries research projects. Thirdly, money was received from the U. S. Department of Commerce through the U. S. Fish and Wildlife Service under the Accelerated Public Works program. This program was initiated primarily for furnishing employment in parishes designated as economically distressed areas. This money was used to build public boat launching ramps with parking areas.

During this biennium, one Dingell-Johnson research project was completed and a final completion report will be published. The project is entitled "An Ecological Survey of Factors Affecting Fish Production in a River and a Backwater Area". This was a four year project, studying fish, fish food and environment of fish in the Amite River and the Spring Bayou backwater area.

Two new Dingell-Johnson research projects were initiated during the last biennium. One is a continuation of the ecological survey entitled "An Ecological Survey of Factors Affecting Fish Production in a Natural Lake and a River", which is a project that continues to catalogue the types of waters in Louisiana and is set up as a three year investigation. The project areas are Lac Des Allemands and the Sabine River. The other is entitled "The D'Arbonne Lake Investigations". This project will follow the development of an impoundment and its fish population and management in a six year investigation. Data from both of these projects will add much to knowledge of the fisheries in Louisiana.

Other current Dingell-Johnson projects are: "Bussey Lake Investigation" and "An Investigation of Sport Fisheries in the Coastal Waters in Louisiana". The coastal project is in the Lake Borgne-Biloxi Marsh complex and studies are made on the fish populations and their migrations and the available fish food.



HARRY E. SCHAFER
Supervisor

The three state fish hatcheries were in full production during this period with propagation of bass, bluegill and catfish. Two other species were handled and stocked in Louisiana. One was the walleye, a game fish of the first quality which reaches a length of three feet and a weight of twenty-five pounds. It is essentially a piscivorous fish, but also feeds upon crawfish. Its flesh is white and firm and of a flavor to satisfy the most fastidious. This fish was stocked in Lake D'Arbonne with the hope of establishing a reproducing population. The other species is the striped bass, an anadromous fish that comes into freshwater to spawn. Louisiana had a small population of this fish in the Florida parishes some thirty years ago, but it has just about disappeared due mainly to pollution. This fish was stocked in the Sabine River and in Lake D'Arbonne. This fish is an excellent sport fish which reaches a weight of one hundred pounds with many fish in the thirty-five pound class. Both of these introductions will be on a three year basis. With this new fish introduction project, the other research projects and the increased demand for fish, the three fish hatcheries are having a difficult time keeping up the required production. It is planned that new ponds be constructed at all hatcheries. Several small new ponds were constructed at the Beechwood Fish Hatchery in order to expand the investigation of the bullfrog.

A cooperate fish disease and parasite project was initiated with Louisiana being one of the ten participating states. The research center is at Auburn University. During this period the supervisor and one fisheries biologist attended a short course at the center and the project personnel came to L.S.U. and gave a short two day course to the fisheries section personnel.

The project leader from the cooperative statistic project with its headquarters at North Carolina

College in Raleigh, came to Louisiana and gave a short course in sampling and creel census. All fisheries biologists attended.

The bioassay project continued with several reports being published. The farm pond project continued and the demand for this service has again increased. The project leader could not fulfill all the requests without the help of the other district fishery biologists. The lake management project also continued with studies on the the yo-yo fishing, can fishing and slat trap fishing. The demands for this project also increased and an assistant project leader should be added in order to keep up with the increasing demand.

Several national and regional meetings were attended by the fisheries biologists and several scientific papers were presented by our biologists at these meetings based on the findings of our research projects.

The Fisheries Section office was moved from the main office on Royal Street in New Orleans, to Baton Rouge at the Old Peabody Hall. This was part of the Fish and Game Division move to Baton Rouge in relocating the administrative office.

All fishery personnel attended a two week in-training school at Louisiana State University.

Hurricane Betsy caused heavy damage to a nineteen foot, inboard-outboard cabin boat that was used in the coastal project. This boat will be replaced as the damage was covered by insurance.

Three fisheries biologists were employed during Rouge district replacing the fisheries biologist who went to another state. One biologist was assigned to the District V office in DeRidder and he will work on the Toledo Bend Reservoir and other district fishery problems. The other biologist was assigned to the New Orleans fishery laboratory and is doing a study on fish blood, plus water chemistries, plankton studies and benthos studies. This section is still in need of a fisheries biologist at the District IV office in Ferriday, and a full time biologist to work with commercial fish in ponds.

A more detailed report on the activities of each project and district follows:



The above equipment is used by fisheries crew when studying fish population in various lakes and water bodies throughout Louisiana.

LAKE MANAGEMENT PROJECT

LLOYD POSEY
Fisheries Biologist

Introduction

Research concerning fish population sampling and management and the application of management techniques are the basic duties of the Lake Management Project. Despite recent advances in fishery science, the tools or techniques available to the fishery manager are rather limited. For this reason much of our efforts are directed toward research projects having possible management applications. In addition to searching for new management techniques, we conduct basic fish population studies and ecological surveys in our major lakes. Each lake has its individual characteristic; therefore, study of its ecology is a prerequisite to its proper management. Facts and techniques derived from our research projects are utilized in managing our fishery resources.

Listed below are some examples of management projects and the research projects which were given attention during this biennium.

Management Activities

Water level fluctuation—This multiple purpose management technique is an adaptation of a natural phenomenon which produces good fishing. Natural lakes along rivers overflow in the spring, then recede in summer and fall. The effect on fish populations is beneficial, and excellent fishing is the result. After carefully studying the basin configuration, water sources, control structure capabilities, and fish populations, we prescribe a controlled drawdown for many lakes. It is used as a weed control measure as well as a population management tool. Examples of lakes for which a drawdown is incorporated in the management plan are Anacoco Lake, Lake D'arbonne, Bussey Brake, and Bundicks' Lake.

Rough fish removal projects—Some lakes are closed to commercial fishing and rapidly build up large rough and commercial fish populations. Since these fish compete with game species for food and space, it is necessary to keep them in check. A study of the fish population in Lake Bruin showed an abundance of commercial fish of legal size. We recommended a large scale removal project designed to bring the commercial fish back within acceptable limits and improve sport fishing. In co-operation with the Tensas Parish Police Jury this project was undertaken in the fall of 1965. At the end of a 30 day harvesting period, 98,931 lbs. of commercial and rough fish had been removed.

Total kills and restocking—Occasionally we find a lake that is so badly out of balance that we deem it necessary to kill out the entire population

and restock with desirable species. This technique is usually limited to small lakes since the chemicals used in treatment are very expensive. Clear Lake, on Barksdale Air Force Base, was the scene of the total kill technique in October, 1965. Project personnel applied the chemical, which was purchased by the Air Force, and eradicated the existing fish population. Restocking with bluegills, bass and crappie will complete the undertaking.

Partial kills—Sometimes we can favorably influence a fish population by removing a part of the fish with chemicals or other means, then restocking with predators such as bass. An overcrowded bluegill population in Harmon Lake was reduced with rotenone, then some extra-large fingerling bass were added. Population checks in following years indicated that, in this case, balance was restored and good fishing was created.

Research Projects

Slat trap study—The study of the selectivity and effectiveness of wooden slats, initiated in 1961, was completed in 1964. The results were prepared and presented at the 18th Annual Conference of the Southeastern Association of Game and Fish Commissioners. The paper, entitled "Evaluation of Slat Traps As Commercial Fishing Gear in Louisiana", will be published in the proceedings of the above organization.

Our findings indicated that slat traps are selective for catfish. These devices can take catfish more efficiently than small mesh hoop nets. Game fish are captured infrequently, accounting for less than one per cent of the total catch throughout this study (Table I). We recommend the legalization of this gear.

Can study—Lac des Ailemands, located 40 miles west of New Orleans, supports an extensive com-



Crew sorting and weighing fish taken in rotenone sample—Douglas Res. Tenn.

mercial fishing industry. Trotlines have been the only legal gear for a number of years. During certain periods each year, primarily the spawning season, catfish cannot be taken in any quantity with trotlines. As a result, a unique method of harvesting has evolved. This method utilizes old cans, buckets, and barrels having the mouth bent so as to be almost closed. An opening large enough to permit entrance of a catfish is fashioned at one side of the mouth. Cans are placed on the bottom of the lake in fairly shallow water. Usually a diver goes overboard, places his hand over the opening and pours the contents into a dip net held by a companion.

In 1963 a study was initiated which was to determine the efficiency, selectivity, and impact upon production of this method of fishing. The project was completed in 1965 and results reported at the 19th Annual Conference of the Southeastern Association of Game and Fish Commissioners. The paper, entitled "The Use of Cans in Harvesting Catfish", will be published in the proceedings of the above organization.

Table I
TOTAL RESULTS OF SLAT-TRAP FISHING WITH PROJECT TRAPS
1,456 TRAP-DAYS

Species	Total No.	Avg. Length	Total Weight	Avg. Weight	% of Total No. Caught	No. Trap-Day
Channel catfish	313	14.6	464.9	1.5	90.46	.215
Blue catfish	8	13.8	8.9	1.1	2.31	.005
Flathead catfish	7	19.5	43.5	6.2	2.02	.005
Black bullhead	6	11.7	6.0	1.0	1.73	.004
Yellow bullhead	5	10.9	3.5	0.7	1.45	.003
Brown bullhead	2	13.3	2.3	1.2	0.58	.001
Longear	1	4.0	0.1	0.1	0.29	.001
Bluegill	2	7.0	0.4	0.2	0.58	.001
Striped mullet	2	16.0	2.9	1.5	0.58	.001

TOTALS 346 ... 532.5 .. 100.00%

Number of fish captured per trap day = .238

Lbs. of fish captured per trap day = .366



A. A. Baur, Ed Whatley (N.L.S.C. biology prof.), and Prentiss Porter using electrofishing gear in Lake Concordia.

We have determined that cans are extremely selective, capturing channel catfish almost exclusively. Most of the fish taken are under the 14.0" minimum legal length (Table II). Although seasonal, the cans are efficient during the time they are used.

All fish examined were sexually mature. Females slightly outnumbered males in total catch. Eggs are not found in significant quantities until the cans have remained undisturbed for five or more days.

Production in Lac des Allemands has been increasing since can fishing became common. We

conclude that the use of these devices is not detrimental in this lake.

Yo-yo study—The controversy surrounding the mechanical fishing devices known as "yo-yos" prompted an investigation of the impact of them upon game fish populations. The study was begun in March, 1965, and will be completed in 1966. Preliminary results indicate that yo-yos are relatively inefficient when the time element is considered. Catch of game fish was 14.1% of the total. These devices do not appear to be depleting game fish populations at this rate (Table III). Mortality can be kept at a minimum by proper adjustment and frequent checking of gear.

Electro-fishing research and development project—The development of an electric fish population sampling gear that will work in all water types and on all species of freshwater fish is the ultimate goal of this project. If it could be developed it would have a wide range of applications. Some are:

Population sampling—It would no longer be necessary to kill fish with chemicals; a properly designed electro-fishing unit merely stuns fish temporarily, doing no permanent harm.

Table II

TOTAL RESULTS OF CAN FISHING

<i>Species</i>	<i>Total No.</i>	<i>Average Length (Inches)</i>
Channel catfish	716	11.71
Flathead catfish	5	9.70
TOTAL	721	
Total can-days fished	2,819*	
Total number of sets	1,460**	
Number captured per can-day	.256	
Number captured per set	.494	

*A "can-day" is one can fished for a period of 24 hours.

**A "set" is one can fished until raised and checked, regardless of time interval involved.

Modern aluminum seine barge used in population sampling — Herman Nugent and Prentiss Porter.



Table III
COMPOSITION OF CATCH WITH YO-YOS
26,261 Yo-Yo Hours
March 24 - May 7, 1965

<i>Species & Grouping</i>	<i>Total No. Caught</i>	<i>Avg. Length (Inches)</i>	<i>Total Weight (Lbs.)</i>	<i>Avg. Weight (Lbs.)</i>	<i>Condition of Fish</i>	<i>% of Total Number</i>
PREDATORY GAME FISH						
Largemouth bass	8	11.5	6.1	0.76	87.5% Alive	1.91
Yellow bass	2	11.5	1.3	0.65	100.0% Dead	0.48
Black crappie	20	10.1	15.0	0.75	90.0% Alive	4.78
White crappie	7	11.4	5.8	0.83	57.1% Alive	1.67
Sub-Total	37		28.2			8.84
NON-PREDATORY GAME FISH						
Warmouth	18	6.2	5.7	0.32	77.7% Alive	4.31
Bluegill	4	6.3	1.6	0.38	75.0% Alive	0.95
Sub-Total	22		7.2			5.26
NON-PREDATORY FOOD FISH (Commercial Species)						
Black bullhead	118	9.1	54.0	0.46	38.9% Alive	28.23
Brown bullhead	36	13.9	67.5	1.88	100.0% Alive	8.61
Yellow bullhead	77	10.3	63.0	0.82	90.9% Alive	18.42
Freshwater drum	11	16.7	38.0	3.45	72.7% Alive	2.63
Sub-Total	242		222.5			57.89
PREDATORY FOOD FISH (Commercial Species)						
Spotted gar	6	21.3	8.7	1.45	83.3% Alive	1.44
Shortnose gar	1	18.0	2.0	2.00	100.0% Dead	0.24
Longnose gar	1	20.0	2.6	2.60	100.0% Alive	0.24
Bowfin	4	17.8	11.3	2.83	100.0% Alive	0.96
Flathead catfish	3	13.3	4.1	1.37	100.0% Alive	0.72
Blue catfish	2	20.0	9.2	4.60	100.0% Alive	0.48
Channel catfish	100	15.6	201.8	2.02	96.0% Alive	23.92
Sub-Total	117		239.7			28.00
GRAND TOTALS	418		497.6			99.99%

No. of fish per yo-yo hour 0.016

Population manipulation or management—A single or several species could be removed without harming desirable fishes. This would probably be limited to small bodies of water.

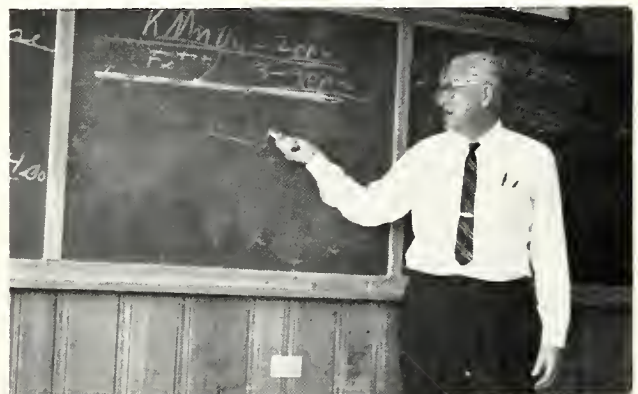
Brood fish collection—In the past it has been necessary to periodically seine brood fish for hatchery use. An electro-fishing unit that works on all species would prove most helpful in this respect.

Our research and development program began in January 1965, with the construction of a special electro-fishing boat. It has several safety features incorporated into the design for maximum protection for personnel. The unit has been moderately successful in several areas throughout the state. It is most effective in shallow water on bass, bluegills, and shad. The unit is usually operated at night since fish are less wary and can be approached with ease. We have successfully captured approximately 300 bass in two nights work. These are to be used for hatchery brood fish. Additional equipment and refinement of existing gear and techniques should give us an excellent management tool.

Fish Population Studies

One of the most important phases of our re-

search program is our fish population sampling and investigation of the major lakes throughout the state. By frequently checking populations, we can detect any changes and have background data readily available for comparison. These population samples are taken with the use of rotenone, nets, seines, traps, and electricity. Fish population samples were taken in the places listed below during this biennium. Some were sampled twice during this period (Table IV).



Dr. Homer Swingle of Auburn University giving a lecture to the fisheries personnel at L.S.U. The Commission is a participant in a cooperative research project on fish diseases and parasites.

Table IV
FISH POPULATION STUDIES
1964-65

<i>Body of Water</i>	<i>Type of Sample</i>
Amite River	Rotenone
Anacoco Lake	Rotenone
Barksdale A. F. B.	Electricity & Rotenone
Bayou Macon Cut-off	Rotenone
Black Bayou, Monroe	Rotenone
Black Lake, Campti	Rotenone
Bear Lake	Rotenone
Brushy Bayou	Seine
Bundicks' Lake	Rotenone
Cane River Lake	Rotenone
Cheniere Lake	Rotenone
Chemin-a-Haut State Park	Rotenone
Clear Lake, DeSoto Parish	Rotenone
Clear Lake, Richland Parish	Rotenone
Davis Lake	Rotenone
Horseshoe Lake	Rotenone
James Lake	Rotenone
Kepler Lake	Rotenone
Lac des Allemands	Electricity & Rotenone
Lake Bruin	Rotenone
Lake Bonne Idee	Rotenone
Lake Concordia	Electricity
Lake Louie	Rotenone
Lake Peigneur	Rotenone
Lake Providence	Electricity & Rotenone
Lake St. John	Rotenone
Lake St. Joseph	Rotenone
Nantachie Lake	Rotenone
Old River	Rotenone
Red River	Electricity
Saline Lake	Rotenone
Sibley Lake	Rotenone
Woolen Lake	Rotenone

FISH HATCHERY AND FARM POND PROJECT

SAMMY STOKES

Fish Hatcheries

The Louisiana Wild Life and Fisheries Commission maintains and operates three fish hatcheries. These hatcheries and their location are as follows; the Huey P. Long Fish Hatchery, Lacombe; Beechwood Fish Hatchery, Forest Hill; and the James A. Noe Fish Hatchery, Monroe.

The purpose of the fish hatcheries is to furnish the initial brood stock of suitable game species of fish for new or reclaimed impoundments throughout the state. These impoundments include both public and private impoundments.

These hatcheries normally produce bluegill (*Leponis macrochirus*), largemouth black bass, (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and channel catfish (*Ictalurus punctatus*). The Lacombe fish hatchery has successfully perpetuated an experimental stocking of Tilapia (*Tilapia mossambica*) since 1959. I will discuss this along with other experimental species later.

The production figures for the hatcheries including the numbers and species are as follows



Fingerling channel catfish being stocked in a Louisiana Lake.

for the previous biennium. The Huey P. Long Fish Hatchery produced 61,350 largemouth black bass; Beechwood Fish Hatchery produced 3,333,450 bluegill, 513,260 largemouth black bass, 117,800 black crappie and 66,990 channel catfish; the James A. Noe Fish Hatchery at Monroe produced 1,747,108 bluegill, 496,900 largemouth bass, 173,160 black crappie and 77,700 channel catfish.

The fish produced were placed in impoundments throughout the state with the exception of the channel catfish. One hundred thousand fingerlings of this species were given to the Nebraska Game and Fish Commission in return for two million walleye (*Stizostedion vitreum vitreum*) eggs and one million walleye fry. The impoundments stocked included privately owned farm ponds as well as public lakes. The public lakes stocked by the Louisiana Wild Life and Fisheries Commission during the previous two years included Chicot Lake, St. Landry Parish; Algiers City Park Lake, Algiers; Beaver Park Lake, Lafayette; Zemurray Park Lake, Hammond; Bayou Macon Cut-offs 1, 2, & 3, Franklin and East Carroll Parishes; Kepler Lake, Bienville Parish; Bayou Rouge Cut-off, Cottonport; Lake Vernon, Vernon Parish; Lake St. Joseph, Tensas Parish; Lake Bruin, Tensas Parish; Iatt Lake, Grant Parish; Clear Lake, DeSoto Parish; Cotile Reservoir, Rapides Parish; and D'Arbonne Lake, Union Parish. Aside from the public impoundments stocked there were also 222 private ponds stocked throughout the state.

Along with the production of the normal native species of gamefish in the hatcheries we are now in the process of experimentally rearing and stocking three new species, namely, Tilapia, walleye, and striped bass (*Roccus saxatilis*). I will discuss our methods and results of each species in order named.

The Tilapia is produced at the Lacombe Fish hatchery because of water temperatures. Tilapia perish at temperature of 48°F or lower. The artesian well which is our source of water supply here tends to keep the pond temperatures at a high enough level to overwinter the species with only very slight losses. The water temperature at ground level is approximately 68° to 72° even in the coldest weather. We are perpetuating the species there but the only impoundment to my knowledge where the species has overwintered successfully is Coughlin Lake in St. Landry Parish. It is approximately 700 acres in size. The reason for their success there is due to the power plant, located near the lake, which discharges its water back into the impoundment which is a reservoir for the plant. The water temperatures when returned to the reservoir are usually 20°F above normal water temperature. I might also add that the volume of discharge is large enough to raise the normal water temperatures to a degree to support self perpetuation of the species.

The second species that is under experimentation is the walleye. In April, 1965, Jim Davis and I drove by car to North Platte, Nebraska to pick up 2,000,000 fertile walleye eggs, transport them back to Monroe and attempt to hatch them by jar culture. While we were at North Platte we observed their methods and techniques of jar culture so that we might have a workable knowledge of this operation.

The eggs were transported back in trays packed with ice and water so as to keep the eggs at a temperature as constant as possible. Upon arrival at Monroe the eggs were placed in jars of water and the water was circulated over the eggs in much the same manner as observed in Nebraska, but the eggs were a one hundred per cent loss. I am of the opinion that the distance we transported the eggs was too great. The biologists at Nebraska were also of the opinion that we would have very little, if any, success in transporting green eggs this far for hatching. After the walleye eggs were lost we procured one million fry from Nebraska Game and Fish Commission and one million fry from the Georgia Game and Fish Commission and placed them in D'Arbonne Lake. The fry were transported in plastic bags by plane so that losses would be as small as possible. Only time will tell the results of this type stocking. Our plans are to stock the fry in Lake D'Arbonne three consecutive years. The chances of establishing a fishable population will



Fish hauling tanks made from 55 gallon drums. Mounted in the cover are the two agitators. Also shown is the oxygen tank with the tubes and stones.

be much greater than one stocking operation.

The third experimental species is not a new species to Louisiana but it is new so far as to establishing the species as a sport fish in a fresh-water impoundment. The species concerned is the striped bass. Five hundred thousand striped bass fry were procured from the South Carolina Game and Fish Commission in May, 1965. Fifty thousand were placed in a one acre pond at the Monroe hatchery and four hundred fifty thousand were placed in an eight acre pond at Beechwood hatchery. Prior to stocking the fry, fathead minnows (*Pimephales promelas*) were stocked in the rearing ponds at the rate of twelve to fifteen lbs. per acre. Also, alfalfa hay was placed in the pond prior to stocking at the rate of five bales per acre. The hay was for the purpose of initiating a zooplankton growth desirable for rearing striped bass. The fatheads were for forage also when the striped bass reached a size that they could utilize them. Attempts were made in June and July to harvest part of the number stocked but losses were so great that harvesting operations were postponed until November, 1965. Striped bass apparently have a tendency to lapse into a state of shock when crowded or handled in certain conditions.

The November drawdown of the eight acre pond at Beechwood hatchery produced approximately 3,000 seven and eight inch striped bass. The one acre pond at Monroe produced approximately the same number. Six thousand survivors of 500,000 isn't a very good percentage, but carnivorous fish populations will progressively decrease in number with the length of time held in crowded conditions. Also, when we drained the eight acre pond in June, 1965, our losses may have been greater than we realized.

The striped bass produced at Monroe were



Fisheries biologist, Jim Davis, is stocking fry wall-eye in Lake D'Arbonne.

placed in D'Arbonne Lake and the Beechwood production was placed in the Sabine River. Two thousand were placed in the river at Logansport and 1,000 were placed in the river near Leesville below the dam site in the river. Our hopes are to impound some when the locks at Toledo Bend Dam are closed and also leave some to have access to salt water down the river below the dam site. This project is also set up to be carried out for stocking three consecutive years.

One other project aside from fish worthy of note is the bullfrog rearing project at Beechwood and Lacombe hatcheries. This project was initiated in March, 1963, for the purpose of finding out the feasibility of producing bullfrogs (*Rana catesbeiana*) commercially.

At the beginning of the project two pens were built enclosing two small ponds at Beechwood hatchery. The pens were constructed of tin to prevent the escape of frogs. The dimensions of the pens were 70 ft. x 30 ft. x 4 ft. high and 95 ft. x 60 ft. x 4 ft. high. Twenty males and thirty-three females were placed in the larger pen to spawn in March, 1963, and did so very readily. After the broodstock had reproduced they were removed from the large pen and placed in the smaller one to prevent them from preying upon the tadpoles. Some of the tadpoles formed into frogs by the fall of 1963 and some overwintered as tadpoles. Approximately one hundred fifty tadpoles and frogs were gathered at this time and their average length was 2.5 inches. I think the reason for some tadpoles forming frogs and some overwintering as tadpoles was the spawning dates of the brood stock. Eggs that were spawned early in April probably

formed frogs while the later ones overwintered as tadpoles.

A lack of pen space prevented us from grading the frogs from the tadpoles and placing them in separate pens. This I am sure caused heavy predation.

Electric lights were strung in the two pens and lighted nightly to attract feed, insects, etc. for the frogs. This however produced an inadequate supply of food after a short period of time.

The three main problems encountered in producing bullfrogs to a marketable size are (1) an adequate food supply (2) predation of birds, agrets, kingfishers, etc. and (3) predation among themselves. Since bullfrogs are strictly live feeders, we could not entice them to eat any artificial feeds and we did not find any live feed to afford an economically feasible source. Also, aside from birds preying upon them we found that the bullfrogs would eat other bullfrogs smaller than themselves in much the same manner as bass when kept under crowded conditions.

The bullfrogs were harvested from the 95 ft. x 60 ft. pen in the fall of 1964. Fifteen adult bullfrogs were harvested which is an inadequate number to be grown commercially, but I think the small number was due primarily to reasons described above.

At the present time nine new ponds are being completed. This will give us an opportunity to try different ratios of tadpoles, different food supplies, and more severe grading of the frogs from the tadpoles. Also some pens are going to be covered to attempt to determine the amount of predation by wild birds.

These added number of pens should give us an applicable knowledge of the feasibility of producing bullfrogs commercially.

Other than fish production and the experimental projects described, there have been some improvements to hatcheries.

A new bunkhouse was constructed at Beechwood and has been very useful in affording lodging to crews when fish removal operations, managed hunts, etc. are being carried out.

Five new ponds have been constructed at Monroe and have been a great help with the ever increasing need for pond space in any hatchery.

Also, enough new pipe has been purchased to renovate the water distribution system at Lacombe. Work will be begun on that immediately after fish removal operations from the hatcheries have been finished.

The Farm Pond Project

BY SAMMY STOKES
Fisheries Biologist

The farm pond project is still being operated in much the same manner as it has since it was begun; that is, to furnish advice to the public

toward managing farm ponds for sport fishing.

There were two hundred twenty-two farm ponds checked or stocked or both during the past two years. The ponds were checked for fish population balance, aquatic weed problems, and problems with the pond itself, such as muddy ponds, etc.

The main problems with most ponds still seem to be an overcrowding of forage fish (bluegill) and an entry of wild fishes (bullheads, green sunfish, etc.). The probable cause for an overcrowding of forage fish is due to a lack of harvest of the species. People that were questioned as to type fishing they did, revealed that most of them had a tendency to fish for bass and let the bluegill populations expand without being harvested. This is a problem each pond owner will have to correct himself. Approximately five pounds of bluegill should be harvested for each pound of bass. A great many of the wild fish problems would be solved if the pond owner would select a better site for its location. Many of the sites permit water to back into ponds from below the spillway and this in itself is inviting undesirable species. Also, no live bait other than worms or crickets, etc. should be allowed to be used in ponds. Any shiners or other live fishes used as bait produce problems eventually as they are undesirable if they escape into the pond and later reproduce.

Great strides have been made in correcting weed problems in ponds. There are many aquatic herbicides on the market now, and most of them are economically feasible, at least on a farm pond basis.

Anyone who wishes advice in mapping out a suitable management plan for sport fishing in a farm pond can writing to Sammy Stokes, P. O. Box 278, Tioga, Louisiana.

DISTRICT SEVEN FISHERY ACTIVITIES

GLADNEY DAVIDSON
Fisheries Biologist

By working with the various fishery biologists in the Louisiana Wild Life and Fisheries Commission valuable experience, touching all phases of fishery work, was obtained during the first six months of employment by the Commission.

In January 1965, this biologist was officially transferred to Baton Rouge and began work as the District VII Fishery Biologist. Listed below are some of the accomplishments achieved in 1965:

Louisiana Wild Life and Fisheries Commission In Service Training School

This two week school covering all phases of Commission work was successfully attended.

Fish Parasite and Disease Seminar

A two day seminar taught by the Auburn University was attended.

Fish Inventory

Some six weeks were spent in East Feliciana, West Baton Rouge, Pointe Coupee, Acadia, Rapides and Iberville parishes collecting fish by means of seines, rotenone and electric shocker. Fish collected were turned over to the District II Fishery Biologist and to Northeast Louisiana State College for cataloguing and identification.

Yo-Yo Fishing

Yo-Yo's, automatic fishing devices that operate on a principle similar to a toy yo-yo, were fished for a total of 133 yo-yo days. Fifty-five fish representing eight different species of fish were caught.

Fish Kills

Six fish kills were checked. Most were found to be due to a lack of oxygen in the water; the deficiency was caused by a very heavy plankton bloom. One fish kill was due to a fish disease and two were found to be due to pollution.

Farm Ponds

Assistance was requested by 29 pond owners. Advice was given in each instance and most ponds were checked. It was recommended that many of the ponds be stocked with fingerling fish.

Boat Ramps

At the present time in District VII, there are eight boat ramps either under construction or recently completed.

Can Fishing

A considerable amount of time was spent in preliminary investigation into the use of cans as a method of harvesting catfish. (See Table I.) The can fishing method utilizes old cans, buckets, and barrels having the mouth bent so as to be almost closed. An opening large enough to permit entrance of a catfish is fashioned at one side of the mouth. Cans are placed in selected locations in a line of 10 to 50 or more. Catfish enter the can for a variety of reasons. Fishermen capture the catfish by placing his hand over the opening, thereby trapping the fish, then raising the can and pouring the contents into a dip net. It was found that the use of these



Louisiana Wild Life and Fisheries personnel, Arnaud and Hankins, demonstrating a method of can fishing.

devices was not detrimental to the catfish population.

Southeastern Association of Game and Fish Commissioners

From results obtained by can fishing a paper was co-authored and presented to fishery personnel representing the thirteen southeastern states.

Farm Pond Tour

One week was spent in Alabama observing fish management techniques and methods utilized by the Alabama Conservation Department and Au-



Determining the length at maturity and gonad condition of a channel catfish from Lac Des Allemands.

burn University. Much useful information was obtained and has been utilized in farm pond management in Louisiana.

Table I
TOTAL RESULTS OF CAN FISHING

Species	Total No.	Average Length (Inches)
Channel catfish	716	11.71
Flathead catfish	5	9.70
TOTAL	721	
Total can-days fished		2,819*
Total number of sets		1,460**
Number captured per can-day		.256
Number captured per set		.494

*A "can-day" is one can fished for a period of 24 hours.
**A "set" is one can fished until raised and checked, regardless of time interval involved.

Lake Management

Several weeks have been spent working with fishery crews from other districts. Information obtained from rotenone, trammel net and flag net samples allowed the district fishery biologist to make his lake management recommendations.

New Projects

Currently two projects are being drafted and are to be initiated in 1966. They are as follows:

A. "A Continuation into the Use of Cans in Harvesting Catfish." The objectives of the project are (1) to determine if cans are seasonal gear or if cans can be utilized the year round as a method of harvesting catfish; (2) to determine if blue catfish, *Ictalurus furcatus*, and the flat head catfish, *Pylodictis olivaris*, can be caught when the can fishing method is modified by utilizing drums rather than cans; (3) to compare the effectiveness, selectivity, and effect upon production of can fishing in Lac Des Allemands (site of the original investigation) to the effectiveness, selectivity, and effect upon production of can fishing in several lakes located throughout the state.

B. "A Preliminary Investigation into the Length at Maturity of Blue Catfish, *Ictalurus furcatus*, and Flathead Catfish, *Pylodictis olivaris*, in Louisiana." The objectives of these projects are to determine the length at which the blue catfish and flat head catfish reach sexual maturity.

APW BOAT LAUNCHING PROJECT

HARRY E. SCHAFER

Construction of public boat launching ramps and parking areas continued during this period. Funds for this program were allocated under Public Law 87-658, Accelerated Public Works Act which was to provide employment relief in

A recently completed Mississippi River Boat Ramp at Donaldsonville, Louisiana.



designated economically distressed parishes in the state. The money was available on a 50-50 matching basis.

The commission is indebted to the Louisiana Department of Public Works for the preparation of plans and specifications for most of the ramps, for advertising for bids and their recommendations on acceptance of bids and for supervising the work of the contractors.

This program ended in February 1965. All jobs that were under way and those approved prior to this day will be completed. All construction must be completed by March 15, 1966.

During the past biennium twenty-seven public boat launching ramps and parking areas were completed. These twenty-seven ramps are on twenty-three bodies of water in eighteen parishes. The cost of these areas was approximately \$200,000. Listed below are the nineteen ramp locations:

- Nantachie Lake in Grant Parish
- Anacoco Lake in Vernon Parish
- Horseshoe Lake in Concordia Parish
- Black Lake in Natchitoches Parish
- Chene Blanc in Livingston Parish
- Big Creek in Avoyelles Parish
- Old River in Avoyelles Parish

- Bayou Falcon in Catahoula Parish
- Black River in Catahoula Parish
- Tensas River in Franklin Parish
- Lake Verret in Assumption Parish
- Little River in Grant Parish
- Ouachita River in Union Parish
- Lake Arthur in Jefferson Davis Parish
- Lake D'Arbonne in Lincoln Parish
- Clear Lake at Sandy Point in Natchitoches Parish
- Mississippi River at Donaldsonville in Ascension Parish
- Lake D'Arbonne north spillway in Union Parish
- Lake D'Arbonne south spillway in Union Parish
- Lake D'Arbonne in Union Parish
- Lake Martin in St. Martin Parish
- Cheniere Lake in Ouachita Parish
- Half Moon Lake in St. Landry Parish
- Atchafalaya River at Butte LaRose in St. Martin Parish
- Bayou Benoit in St. Martin Parish
- Vernon Lake in Vernon Parish

There are six remaining boat launching ramps to be completed and this program will be closed out. The six ramps are on five different bodies



A.P.W. boat launching ramp and parking area on Lake Charles, Calcasieu Parish.



A.P.W. boat launching ramp and parking area on Lake Verret, Assumption Parish.



A.P.W. boat launching ramp and parking area at Lake Martin, St. Martin Parish.



Construction of a boat launching ramp and parking area at Rosethorne Park, Jefferson Parish.

of water in four parishes. Listed below are the ramps to be completed by March 1966:

- Fort Pike State Park in Orleans Parish
- Pearl River at Highway 10 in Washington Parish
- Pearl River at Angie in Washington Parish
- Bogue Chitto River at Franklin in Washington Parish
- Rosethorne Park in Jefferson Parish
- Calcasieu Lake in Cameron Parish

The following are jobs that were completed and reported on in the last biennial report:

- Calcasieu River in Allen Parish (2 ramps)
- Pearl River at Port Vincent in Ascension Parish
- Bayou Francois at Gonzales in Ascension Parish
- Prien Lake Park in Calcasieu Parish
- Ouachita River in Catahoula Parish
- Bayou Macon in Franklin Parish
- Vermillion River in Lafayette Parish
- Sibley Lake in Natchitoches Parish
- Cane River Lake in Natchitoches Parish
- Lake Charles in Calcasieu Parish
- Whiskey-Chitto Creek in Allen Parish
- Anacoco Lake in Vernon Parish

Some of the finished ramps were damaged by

high water. The commission has kept the facilities in operation with regular budget money as the APW programs had ended. Their maintenance will be a regular function of the commission.

NEW ORLEANS LABORATORY

PENNY J. DEEN

Fisheries Biologist

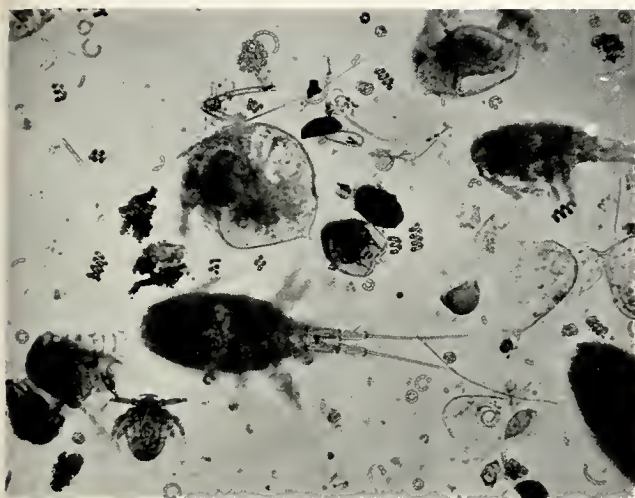
The New Orleans laboratory works in conjunction with the project leaders of F-11-R and F-8-R in conducting tests that would otherwise be impossible to record if attempted in the field. These include the chemical analysis of water and qualitative and quantitative analyses of plankton.

Water samples are taken from predetermined stations in the F-11-R project and brought monthly into the laboratory in a frozen state. These are tested chemically for the amounts of nitrates, nitrites, ammonia and organic nitrogen, total and available phosphates, and chlorides that are available in the water. The above elements are necessary to carry on the life functions of plants and animals present in the body of water.

Net and nanno plankton samples are immediately preserved in the field and later brought into the laboratory for analyses. Plankton forms the basis of the food pyramid and is, therefore, very important to aquatic fauna and the higher forms of the food chain. The net plankton, which is comprised of the larger microscopic plants and animals, is preserved in formaldehyde for species identification. Net and nanno plankton samples preserved in alcohol are gravimetrically analyzed to obtain the amount of plankton present in a particular sample. These results show relatively how much plankton is readily available to the fish



Blood is being drawn directly from the heart of an anesthetized bass with a pointed capillary tube. A remarkably high percentage of fish live after having blood withdrawn using this method.



Photomicrograph predominantly shows the larger zooplankton present in a Des Allemands water sample.

for food at any particular time of the year.

Tests on chlorides and turbidity are conducted on water samples from the F-8-R project. These tests are especially pertinent to this project as it is concerned with estuarine waters.

The laboratory has purchased new equipment for a project that is just being initiated in fish hematology. It includes the electrophoresis of various serum proteins and glycoproteins present in fish blood and microhematocrit readings of blood samples. Samples are being taken from numbers of fishes with emphasis on bass and bluegill. The results recorded are designed to establish a normal for healthy fish.

Blood is taken directly from the heart of an anesthetized fish with a pointed capillary tube and centrifuged in a high-speed micro-hematocrit centrifuge. After the micro-hematocrit reading is taken, which gives the red blood cell volume present in the sample, the serum produced is electrophoresed and the density bands are graphically transcribed. The amounts of various proteins present are calculated from the graph with the aid of a planimeter and the results are recorded. An unusually high or low protein reading in blood serum or red blood cell volume in whole blood is indicative of an abnormal body condition.

The laboratory employs two student assistants on a part-time basis to aid in these projects.

INVESTIGATIONS OF FISH MANAGEMENT PRACTICES

DINGELL-JOHNSON PROJECT F-7-R

JAMES T. DAVIS
Fisheries Biologist

JANICE S. HUGHES
Fisheries Biologist

Louisiana's outstanding fishing is of major importance in our sportsman's paradise. If we

are to maintain the impetus of this third largest industry in the state, we must assure continued good fishing. Our lakes and impoundments produce the major portion of the fish for this phenomenal fishing success.

This project is intended to determine the best methods for maintaining good fishing through a balanced fish population. We are studying several possibilities. Three seem to offer the best solutions at this time. These are (1) water level fluctuation for the control of aquatic vegetation and nuisance fish populations (2) trees in the lake to concentrate the fish and the fishermen and (3) the stocking of new kinds of fish to control rough fish.

Water Level Fluctuation

Under natural conditions the water levels in our back water and river connected lakes fluctuate widely. In the late winter or early spring the water is high and remains so until early summer. Then the water drops and remains low until the following year. Excellent fishing during most of the year is the result. Properly managed water level fluctuations attempt to duplicate this result.

We are working with a number of lakes within the state using this particular management practice. Our most accurate checks of results are on Bussey Lake in Morehouse Parish, Lafourche Lake in Caldwell Parish and D'Arbonne Lake in Union and Lincoln Parishes.

On Bussey Lake we are attempting to maintain good fishing, on LaFourche we were attempting to restore good fishing. Our results are as varied as the lakes. Let's look at each of the lakes and see what was accomplished.

BUSSEY LAKE

Bussey Lake is a 2200 acre lake near Bastrop that was built by International Paper Company for a fresh water supply. The lake is unique because it has no drainage basin. All water must be pumped into the lake to fill it. This assures positive water control during the fluctuation.

From 1960 until early 1962 this lake furnished outstanding fishing. By July of 1962 the lake was heavily infested with water weeds (primarily Southern naiad and narrow leafed pondweed) and the equally obnoxious gizzard shad. Therefore, the lake was lowered in October for trial of a winter drawdown. The lake was returned to pool stage in late April 1963 and fishermen flocked to the "rejuvenated" lake. They were well rewarded. Fishermen caught more fish and bigger fish than in any year since the lake opened. Everyone pronounced the fluctuation program a tremendous success.

Just why was the fluctuation so successful? Weed control was excellent with over 95% of the

Table 1
SUMMARY OF CREEL CENSUS DATA FOR
BUSSEY LAKE—1960-1965

	1960- 1961	1961- 1962	1962- 1963	1963- 1964	1964- 1965
Estimated number fishermen	55,872	59,172	45,902	86,548	76,107
Length fishing trip	3.93	3.99	4.41	4.45	4.69
Fish per hour	1.95	2.29	1.65	2.11	1.64
Percent successful	85	81	79	74	76
Number pounds per acre	96.1	93.4	79.8	215.3	115.2
Average weights					
Bass	1.07	1.19	1.63	1.86	2.03
Crappie	0.27	0.29	0.56	0.70	0.74
Bluegill	0.33	0.35	0.35	0.28	0.27
Other sunfish	0.20	0.27	0.39	0.32	0.36
Miscellaneous fish	1.10	1.37	1.39	1.53	1.90

weeds destroyed by the action of the drawdown, freezing, and subsequent flooding. This in itself recreated for fishermen an additional 700 acres of the lake. In addition the drawdown crowded the shad into a smaller area which allowed the bass and crappie to efficiently and effectively harvest them. When the lake was reflooded in the Spring, the bass and crappie found their food supply scattered over a much larger area. In search for food, many were caught by fishermen. Fishing has remained good until late 1965. Excessive shad populations have forced the drawdown of the lake again. On this lake the effect of one water level fluctuation was adequate for three years.

LaFOURCE LAKE

This 1000 acre lake is a cutoff stream channel of Boeuf River in Caldwell Parish. In 1961 fishing success had dropped to the point that a request for help was sent to the commission. The primary deterrent to fishermen on this lake was a submerged water weed named coontail. Over 80 percent of the lake was heavily infested.

Late in that year a structure was completed and the lake drawdown. The timing was poor and early rains refilled the lake too early. Results were poor. A summer drawdown in 1962 met with limited success. Due to a high spot in the drainage channel the lake could not be drawn down to the desired level. Further engineering work enabled us to draw the lake partially down but late in the year.

In 1963 spring rainfall was too light to refill the lake. This is the major hazard of water level fluctuation programs. Without water to refill the lake a fluctuation program is doomed to failure.

In the summer of 1963 the lake was returned to drawdown stage with the optimistic view that winter and spring rains would refill the lake. The lake did refill and over 50 percent control of the weeds was accomplished. Due to low spring water levels sport fish spawning was retarded for both years. The unbalanced fish population failed to produce an increase in catch. The fish caught were larger but the total fishing success was un-

improved. The fluctuation program on this lake was only a qualified success.

Local interests decided against continuing the water level fluctuation program in 1964. Accordingly the study was discontinued until suitable methods of refilling the lake are completed.

D'ARBONNE LAKE

This 15,000 acre lake was completed late in 1963 and was filled by March, 1964. By midsummer it was apparent that the clear water in the upper reaches was becoming infested with many types of aquatic plants. In addition the shad population was expanding rapidly. Accordingly plans were made to lower the lake in early September. The lake was lowered five feet and held at this level until December of 1964. By January 24th, 1965 D'Arbonne Lake again reached pool stage. Fishing had been good while the lake was down and now was even better. Catches of fish were much higher than expected for a new lake.

Again in the fall of 1965 it was deemed desirable to lower the water level. The drawdown started early in September. Many fishermen have enjoyed excellent success in catching bass, crappie and sunfish while the lake has been down. Weed control appears excellent.

It is too soon to state just how successful the D'Arbonne Lake water level fluctuation program will become. At present it appears that with continued good management it may equal the success of the Bussey Lake program. If this is realized, Northeast Louisiana will truly have another fisherman's paradise.

Standing Timber in a Lake

Most fishermen prefer to fish near trees, pilings or other obstructions in the water. We are studying the effects of this concentration of fishing effort. Also we studied the effect of these obstruction as fish attractors. The results of this study will be published in the near future.

In short, we found that the trees actually attract both fish and fishermen. Of the two, the fishermen is the most attracted. On Bussey Lake, where bands of trees were left to retard wave

action, over 80 per cent of the fishermen fish these bands. Because the bands cover less than 20 per cent of the lake it is apparent that they effectively drew the fishermen.

These same fishermen had only slightly poorer luck than those fishing the open water. The open water fish were larger but fewer were caught. Rotenone tests in both areas indicated more fish were actually present in the tree areas.

On the basis of these findings it is apparent that it is not necessary to remove all the trees from a lake basin. In fact, if a few are left fishing success may be improved and the fishermen will be much happier.

Introduction of New Species

Louisiana is blessed with the greatest variety of fish of any state in the union. In natural lakes the populations strike a balance. When the fisherman removes large quantities of only certain types of these fish he destroys this delicate balance of nature. In an effort to create a new desirable balance, with many fish for the fishermen, new species are a possible solution. This is a new study in the state, but some progress is being made.

Two new species introduced into the state look promising. These are the striped bass and the walleye. Both are active predators that grow to large sizes, over 10 pounds. The harvest of gizzard shad by these fish is of great interest. If they will help to control the shad, both the walleye and the striped bass should be introduced into state waters.

How will this benefit the fishermen? Actually in two ways. The walleye is an outstanding game fish that is widely sought after in the more northern states. It often reaches sizes in excess of 15 pounds. The striped bass is an equally prized game fish that sometimes reaches weights of 35 pounds or more. These would be a welcome addition to any fisherman's catch. By helping to control the shad they will benefit other sport fish also. If these introductions are successful Louisiana can truly be proud of these additions to *The Sportsman's Paradise*.

EXOTIC FISH STUDIES

Israeli Carp (Cyprinus carpio)

This fish has been under study in the state of Louisiana for approximately six years. Various claims have been made by investigators from other states. Most of these have been evaluated under the conditions present at the Monroe Fish Hatchery.

Control of aquatic vegetation has been variously claimed and denied by other investigators. Our

studies indicate that this fish is effective in weed control only under certain circumstances. In ponds with very high populations of carp, it will control both rooted and submerged vegetation. It will not control marginal species such as spike rush, cattails, primrose or alligator weed. In addition it will not control floating mats of higher vegetation such as alligator weed. It is fairly effective in the control of filamentous algae. Apparently this is due in part to the turbid conditions caused by carp feeding. In numbers less than 100 per acre, we have been unable to secure control of any of the higher aquatics.

The reproduction of this species in ponds is not well understood. Our studies indicate that this fish will spawn in farm ponds regardless of the other species present. Successful hatches have been noted in ponds containing bluegill, largemouth bass, brown bullheads, gizzard shad and blue catfish.

The rate of growth of this fish in the hatchery has been extremely rapid. In uncrowded ponds the fish often reach a weight of 4 pounds when 16 months old. If fed, the fish will reach weights in excess of 7 pounds in the same period of time.

At this time we can find no reason for recommending stocking of this fish in either private ponds or public waters within the state. Due to its high productive rate and its tendency to muddy waters during its feeding, it usually would be undesirable. As the market for this fish is very poor, we do not foresee its possible use as a commercial fish farming species. There is apparently nothing to be gained from the introduction of this fish into the state and there are many hazards involved. We cannot recommend that stocking of this fish be contemplated.

Brown Bullhead (Ictalurus nebulosus)

The brown bullhead has been proposed as a fish for stocking in farm ponds. Its proponents claim that its low reproductive potential make it very desirable. Our studies have been twofold. First, to determine its approximate reproductive potential and, secondly, whether its increased size would make it more desirable as a food fish.

In our pond studies, we have found that though it does have a lower reproductive rate than either the black or yellow bullhead, it still will reach nuisance numbers during its first year. It will take bait readily and does furnish good fishing. Its adult size is usually larger than that of the black or yellow bullhead. In our ponds these fish became so overpopulated that they generally averaged under 1.5 pounds. Most of the population was composed of fish 0.6 pounds or smaller. It, therefore, is not considered a desirable commercial or farm pond species.

Striped Bass (*Morone saxatilis*)

The striped bass presently occurs in Louisiana in limited numbers as an anadromous species. These fish are present only in those streams emptying into the gulf east of the Mississippi River. In recent years the catch records from these streams have shown a decided decline.

Interest in the possibility of stocking this species in Louisiana lakes has been heightened by the apparent success of introductions in adjacent states. An agreement was made with the South Carolina Wildlife Resources Department in the spring of 1965. In exchange for 450,000 striped bass fry, the Louisiana Wild Life and Fisheries Commission agreed to rear the fry and furnish the data obtained to South Carolina free of charge. All expenses were to be borne by the State of Louisiana.

The fry were secured on May 4, 1965. They were transported in plastic bags containing water and oxygen by aircraft to Louisiana. The approximate flight time was five hours at an elevation of 8000 feet. Three hundred sixty thousand of the fry were placed in an eight acre pond at the Beechwood Fish hatchery near Alexandria. The remaining 90,000 were equally divided between two one-acre ponds at the Monroe Fish Hatchery.

The ponds into which the fry were placed contained heavy blooms of zooplankton. These blooms were obtained through the use of hay applied 7 to 10 days in advance of the stocking. The pond at Beechwood was also stocked with 100 pounds of fathead minnow brood fish. At the end of the project year the fingerlings had obtained an average length of three inches and were growing rapidly. Limited examination of the bass stomach contents indicated that the minnows were not being utilized at that time.

The two ponds at the Monroe Fish Hatchery were treated differently in an effort to determine the most desirable methods of cultivating these fish. Each of these ponds received 50 pounds per acre of ammonium nitrate in addition to the hay treatment. One pond was stocked with 30 pounds of fathead brooders. The other pond received approximately 20 pounds of intermediate size bluegill 30 days after the stocking of striped bass fry. At the end of this project year, the bass in each of the ponds seemed to be growing equally well. They are readily seined and an attempt will be made to move the fish for stocking purposes early in the next project year.

Continued studies will be made with this fish. The bass will be stocked in a variety of habitats in an effort to determine the practicability of future stocking and the subsequent establishment of reproducing populations. At present they have been stocked in D'Arbonne Lake and Sabine River.

Walleye (*Stizostedion vitreum*)

The possibility of introducing walleye into Louisiana has been under study for several years. The lack of an established native population and the close proximity of populations in neighboring Arkansas seems to indicate the absence of adequate habitat. After an intensive search of the literature, it was hypothesized that habitat limitations included temperature and spawning areas. The riprap on the dam and highways of newly established D'Arbonne Lake appeared adequate for spawning. In addition, the depth of the lake assured relatively cool water all year. Based on these findings, arrangements were made with the state of Nebraska to obtain green walleye eggs and sac fry.



Fisheries biologists collecting fish samples for a statewide fish distribution publication.

The eggs were obtained while assisting Nebraska fisheries personnel at Lake McConaughy near Ogallala. The brood fish were captured using trap nets fished along the large riprap placed on the dam. As the fish were removed from the net, they were transported to a live barge. The eggs were then stripped from the fish and dropped into plastic pans. After the milt was added, the eggs were allowed to harden for 1-3 minutes. Then a clay solution was added and the eggs swirled to prevent clumping. Water added to the pan of eggs promoted hardening which continued after the eggs were placed in the bobbinet frame for washing. As soon as the eggs were free from silt they were placed in a tank for hauling.

At the North Platte Fish Hatchery the eggs were transferred to containers for hauling to Louisiana. Three methods or containers were used. Part of the eggs were placed in water in polyethylene bags. The other eggs were placed in specially constructed egg trays. These were 1/2 inch apart with burlap bottoms. One of the bundles of eggs trays were kept submerged in cool water while the other was kept damp and cool from ice water dripping down over the trays.

After an overnight trip of over 900 miles which required 18 hours, the eggs were placed in hatching jars. Four days later there was very little difference in hauling methods determined. The attempt to hatch the eggs was unsuccessful due in part to a lack of proper equipment and also lack of experience by the project leaders in treatment and handling of the eggs of cold water fishes.

Walleye fry were secured at the North Platte Hatchery on May 11, 1965. These were placed in 4 mil polyethylene bags and transported by commission aircraft to Monroe. The cruising altitude was 12,000 feet and aircraft temperature 68°F. Prior to departure the bags were loosely inflated with oxygen. At the maximum altitude these bags were quite tight. After a 4 hour 12 minute flight the plane landed on an airstrip within 1/2 mile of the lake. Total elapsed time from hatchery to lake was 5 hours 6 minutes. The 2,046,000 fry were transported in 5 bags each containing 3 quarts of fry plus 4 gallons of water.

The fry were sown in lines across 2,000 acres of the open water of the lake. Water temperature of the lake was 78 degrees and the temperature of the water in the bags was raised to this point by floating the bags on the surface of the lake.

An additional 500,000 fry were secured from the state of Georgia. These were placed in the lake in the same manner.

Approximately 50,000 of the fry were placed in a pond at the Monroe Fish Hatchery. An attempt is being made to determine the feasibility of growing the fry to fingerling size for stocking in established fish populations.

CATFISH SPAWNING AND REARING STUDIES

The use of grease drums or barrels in pens have proven suitable for catfish spawning. These were easily obtainable and deemed adequate for most situations. Penning is not feasible in most farm ponds. Free spawning in these same cans was attempted during the spring of 1964. Fifty adult channel catfish were placed in each of two ponds at an approximate 50:50 sex ratio. This was done to remove the necessity for sexing fish by the farmer under normal field conditions. One pond contained bluegill sunfish and gizzard shad, the other pond was devoid of other fish. Spawning drums were placed in the ponds at the rate of one drum per 10 pairs of fish. Drums were checked periodically to ascertain spawning success. Part of the spawns were removed from the ponds. Others were allowed to hatch and grow. One half of the brooders were removed from each pond after spawning to simulate actual field conditions.

Twenty-seven spawns were obtained from the two ponds in this experiment. Of the twenty spawns found in the competitor free pond, eighteen spawns hatched. Two were lost or destroyed for unknown reasons. Due to the necessity for adding water in June to the ponds, wild fish or eggs were pumped into the pond. These fingerlings were a major part of the population by late July of 1964. It is not known whether or not these small fish affected the spawning activities of the catfish.

Only seven catfish spawns were found in the pond containing adult bluegill and shad. This is much lower than the comparison pond and only four of the spawns hatched.



Chairman of the Commission, Thompson, Director Hair and Commissioner Wright are shown how to sex catfish during a tour of the state's commercial catfish farms.



Members of the board, the Director, reporters, and Commission personnel watch seining of a catfish pond during a tour of the state's commercial catfish farms.

Another pond which was not a part of the experiment was also studied. No wild fish were present, but bullfrog tadpoles were very plentiful. Thirty-six pairs of brood fish produced six spawns. None of these spawns hatched. In each case tadpoles were found in large numbers in the spawning containers. It was the opinion of the investigators that these tadpoles consumed the eggs.

Channel catfish were spawned in pens during the year of 1965. Excellent spawns were obtained. The male parent was allowed to hatch 10 of the spawns and paddle wheel agitators were used for the remaining 10 spawns. The recovery percentage from the paddle wheel troughs exceeded that of the natural method. This was due in part to a better hatching percentage, fewer lost spawns, and ease of removal to starting troughs.

All fry were trough cultured for 1-3 weeks with excellent results. Over 97% of the hatched fry survived and were subsequently moved to rearing ponds. The fry were started on mixture of finely ground fresh liver and powdered gelatin. After the first week, they were gradually shifted to pelleted dry feed. Upon their removal to the rearing ponds, feed consisted entirely of pelleted food containing 31 percent protein of which over one-half was animal protein. Three feeds were used but analysis is not complete at this time.

A bulletin was prepared entitled *Raising Channel Catfish* for distribution to people interested in the commercial production of catfish.

Spawning of Other Catfish

Flathead catfish are of interest to fishery workers as possible predators in ponds and lakes. As yet spawning techniques have not been developed in Louisiana. During this year an unsuccessful attempt was made to spawn flathead catfish in pens. Possible reasons for the failure are many. During the coming year new techniques will be tried.

Inhibition of the spawning of bullheads is also of considerable interest. Preliminary experiments have had only limited success. During the coming year two promising chemicals will be applied in conjunction with water level manipulation. An analysis of the findings will be presented in a later report.

During the coming year spawning of blue catfish and white catfish will be studied.

FISH DISEASES AND PARASITES

The identification of fish diseases and parasites is often requested of most fisheries biologists. Usually the identification is rather sketchy and control measures recommended are vague at best. In an effort to relieve this situation in Louisiana, the present project was devised in 1962. Due to the work load of the project leaders, work was primarily identification and treatment of fish from commercial ponds. These fish were brought to the laboratory by the pond owners and therefore, required a minimum of time.

In 1963 the Southeastern Cooperative Disease and Parasite project was initiated. This relieved, in part, the work of the state project. In October, 1964, the senior project leader attended a training session at Auburn, Alabama. Subsequently, a training session was held in Louisiana in March, 1965, for all fisheries personnel by the cooperative project personnel.

During the period 1961-1964, major effort was extended to determine an effective and positive control of the anchor parasite (*Lernaea cyprinaeas*). Of the many treatments in use, local operators favored applications of wettable powder benzene hexachloride. Experiments with this material were initiated. Results were highly variable. Best results were obtained using an initial treatment of 0.5 ppm followed by weekly treatments using 0.25 ppm for the duration of the summer. Side effects were pronounced and very undesirable. The fish refused to feed from 1-3 days after application. In heavy infestations or severely weakened fish, substantial losses sometimes occurred.

In late 1962, a search for more effective compounds was initiated. Two organic phosphates seemed to offer the best possibilities after preliminary testing. These were methyl parathion and Dylox. As methyl parathion was more readily available, it was put into test in the spring of 1963. One ppm gave acceptable control and retreatment was necessary in only two of the eight ponds treated. Subsequent applications during the summer months, water temperatures above 28°C, failed to produce the desired control below 3 ppm with two retreatments.

Attention was then shifted to Dylox. This chemical produces excellent control (in two tests elimination of 0.75 to 1 ppm) if water temperatures

are below 20°C. Above 25°C one retreatment with 1 ppm is usually necessary after 7 days. The 50 percent wettable powder formulation has consistently produced the best results with the one percent sugar bait providing the poorest results. In eight tests, fish have actively fed on the day following the application.

One precaution must be noted. Dylox has not been approved for application to food fish at this time. Due to the limitation placed on its uses on animals, vegetables and livestock foodstuffs, it appears unlikely that such a label will be granted in the near future.

SPINE TAGGING STUDY

Present methods of tagging are generally deemed inadequate. This study was designed to determine the feasibility of a spine tag. This tag would have the advantage of not piercing the skin of the fish.

Plastic tubing of varying inside diameters was placed on the dorsal and/or anal spines of centrarchids. Tags were also placed on the pectoral and dorsal spines of channel catfish. The dorsal spine of carp was also used as a tagging site.

Two types of plastic tubing were used. Initially, thin wall polyethylene or polyvinyl tubing was used as tags. Shrink tubing was later tried as a tagging material.

Tests with standard polyethylene and polyvinyl tubing met with only limited success. The tags would not remain on the smooth spines of the centrarchids. The tags did work well on the serrated spines of both the channel catfish and the carp. Some difficulty was occasioned through the ulcerating of the area around the point of tag application. This was thought to be caused by the looseness of the tag. On the basis of these findings it was concluded that a tighter fitting tag was necessary.

Shrink tubing seemed to offer the best possibilities for an all plastic spine tag that would fit tightly. As this tubing shrinks to one half its inside diameter when a small amount of heat is applied, it proved adequate from the standpoint of a tight fitting tag. This proved to be less than the total problem as the tags were readily lost.

Examination of the previously tagged fish indicated that most of the tags were lost due to the spine breaking off. To test the mechanism involved, 57 fish of 6 species were marked by several different methods.

In an effort to determine why the spines dropped off the fish, part of the fish were marked by splitting the fin membrane varying distances from the outer edge toward the base of the fin. Only one catfish marked in this way lost its spine. In most cases the fish was fully recovered (membrane entire) at the completion of the study, 30 days later.

Tags were placed on various spines on the re-

mainder of the fish. Tags placed on largemouth bass gave very poor results with only 1/3 of the tags remaining on the fish at the conclusion of the experiment. Of the 14 bluegill tagged, only two retained their tag by the end of the study. In each case the failure was due to the spine breaking off near the base. Results of tagging channel catfish were varied. Of the ten fish tagged only one retained its tag for the 30 day experiment. Five of the channel catfish lost the tag off the spine. Four of the catfish lost the spine. Tagging of black crappie was equally unsuccessful. One fish retained its tag and one fish lost the tag off the spine. The other three fish lost the spine to which the tag had been applied.

This study failed to devise an acceptable spine tag. The shrink tubing was unsuccessful. The actual reasons are not completely clear. Apparently the constricting effect of the tubing cut off the circulation and as a result the spines that were tagged dropped off.

Areas for further investigation include the application of a glue to hold the tag onto the spine.

STATE WIDE FISH INVENTORY

The primary objective of this study is to determine the species of fish present in streams and lakes in the state. Both a technical and popular publication outlining the fish present will be prepared at the completion of this study.

Fish samples have been taken in all 64 parishes. These samples were taken with drag seines, nets, rotenone and electric seines. Fish were taken in both streams and lakes. A few areas are yet to be sampled with electric seines.

Collections are being made by the field personnel of the fisheries section. Identification of specimens will be done by the project leaders with the assistance of Dr. Neil H. Douglas, Professor, Northeast Louisiana State College. The finished collection will be housed at Northeast Louisiana State College in Monroe.

Identification of the fishes has progressed rapidly and over 60 percent of the field collections have been identified, catalogued and placed in the Northeast Louisiana State College Fisheries Museum. At present this includes over one million specimens with over 200 species included. There is a possibility that several new species will be named before the study is completed.

BIOASSAY PROJECT

How can I kill the weeds in my pond and not hurt the fish? This question is asked a fisheries biologist in Louisiana almost every day. A fisheries laboratory located in Monroe is furnishing an answer to part of this question. They have found why sometimes 2,4-D kills the fish in one pond and not in the next one. Other good news

on weed killers is coming from this laboratory daily.

But first, let's find out how this laboratory got its start. Back in the early 50's, people found out that they could kill weeds with chemicals. There was one big problem, sometimes the fish were killed too. Something had to be done. In 1957, Dr. Sam Hardcastle, weed specialist with the Louisiana Wild Life and Fisheries Commission, started the wheels turning. Industrial pollutants were being tested on fish in Monroe. Why not test weed killers the same way? Fisheries biologists at Monroe agreed to try it.

The first laboratory for testing these weed killers (herbicides) was a small vacant room in the office. The equipment used was crude and inadequate. Breakdowns were frequent. Heating was poor and cooling was impossible. In spite of these difficulties, the fisheries biologist in charge had enough data on nine herbicides to make a report after one year. The results were presented at the 1958 meeting of the Weed Society of America. Some of these herbicides were reported safe to use and others unsafe. The report was well received. Soon afterwards, demands for this type of information increased. The Wild Life and Fisheries Commission realizing the need for this information decided to build a new laboratory at Monroe.

Many problems had to be settled before the laboratory became a reality. Plans were drawn up and revised many times before the building was started. Staffing of the laboratory was solved with the appointment of a fisheries biologist-in-charge. Three part-time student assistants were assigned to help. Finally the money to build the laboratory was appropriated. Construction began early in March, 1961. This laboratory was designated as a bioassay laboratory. This means that the laboratory would be used to determine the effects of chemicals on fish and other water animals.

When the laboratory was completed in August, 1961, it was recognized as one of the finest of its kind in the United States. The laboratory is furnished with the newest and best equipment available. Many of its features are unique. The disposable aquarium system developed by the biologists at Monroe is now being copied by laboratories throughout the nation.

The laboratory can be held at a constant temperature. For most bioassays, the laboratory is held at a temperature of 76 degrees. This temperature was selected because it is the average water temperature during the spring. During this time of year, plants make their most rapid growth. For maximum control, water weeds should be sprayed at this time. Therefore, bioassays conducted at this temperature give us the most usable results.

Lighting in the laboratory is arranged for rapid

checking of test results. Fluorescent lights are installed behind each row of aquariums. The number of fish alive can be quickly determined as this light shines through the aquariums. Six large fluorescent ceiling lights light the rest of the room.

Drainage is always a problem in a laboratory where a large amount of water is used. This was solved through the use of three floor drains which carry off any spilt water. After a test is completed, the aquariums are emptied into these drains.

Water is supplied in the laboratory through plastic pipe which is another unique feature. Plastic pipe does not rust and its use removes the possibility that iron or zinc from the pipes might effect the tests. For this same reason, all air lines to the aquariums are also plastic. Within each aquarium, air is bubbled through small holes punched in one end of a plastic tube. Air is supplied by a large compressor located outside the building. A smaller standby compressor is kept in the laboratory. If the large compressor fails to start, the small compressor supplies enough air to keep the fish alive.

Located at one end of the laboratory are four large glass holding tanks. These tanks have individual drains and can be filled separately. Each tank holds about 60 gallons of water. This is enough water in each tank to hold over 2,000 fish for short periods of time. As 2,500 fish are needed for one week's test, these tanks will hold over two week's supply.

Individual test aquariums are made of plywood, fiberglass screen and a plastic bag. A frame is made with screen on the front and back. Plywood is used for the sides. This frame measures 9 x 9 x 20 inches and is painted white both inside and out. White is used to get the most light reflection. The screen is used to allow light from behind the aquariums to shine through and show the fish. A plastic bag is placed inside this frame which completes the aquarium. This aquarium is simple and inexpensive to build. After each test, the plastic bag is removed and destroyed. This prevents mixing of chemicals from test to test.

There is space in the laboratory for 120 of these test aquariums. The size of these aquariums is large enough to permit six inch fish to be used. Up to 25 small fish, under three inches, can also be used.

Several kinds of fish are available for testing in the laboratory. Bluegill, sometimes called bream, are usually used. These fish are raised in the Monroe Fish Hatchery where the laboratory is located. The fish are removed from the ponds and placed in concrete vats in a holding shed. Here the fish are separated and those between one and three inches in length are kept for testing. These fish are then treated to remove any

diseases or parasites which might be present. The fish are then moved to the holding tanks in the laboratory.

Bluegill are used because they are a popular sport fish. They are also about medium in tolerance to herbicides. Shad are too easy to kill and gar are too hard to kill to make good test fish. Bluegill are easy to raise and many are available in the hatchery. Largemouth bass are sometimes used as they are also medium in tolerance. They are too difficult and expensive to raise to use regularly. Crappie (white perch or sac-a-lait) are too difficult to handle to make good test fish.

Another important feature so necessary to a good bioassay laboratory is the preparation room. Our preparation room is connected to the bioassay laboratory by a door at one end. This room is equipped with counter space for measuring liquid herbicides. It also has a sturdy table for the laboratory balance. This balance or scale is used to weigh small exact amounts of dry herbicides. After the herbicides are measured, they are carried to the bioassay laboratory and placed in the individual aquariums.

The use of the preparation room is important. Some chemicals are highly volatile. This means that they are apt to mix with other chemicals if measured in the bioassay laboratory. By measuring the herbicides in the preparation room and carrying them in covered containers to the aquariums, the possibility of mixing is avoided. The use of this preparation room is also important when poisonous herbicides are used. An exhaust fan located in this room removes the poisonous vapors. This is not possible in a bioassay laboratory.

Another important facility is the water testing laboratory. We have found that herbicides affect fish differently in different waters. For this reason we test all water coming into the laboratory. From these tests, we are able to determine how much effect the kind of water used has on the ability of the herbicide to kill fish.

The following is the method used to test a herbicide in the laboratory. First, 6½ gallons of water is put in each aquarium. Then 10 bluegill are placed in each one. Air tubes are then placed in the aquarium, and the air flow regulated by valves. Exact amounts of herbicide are then measured and placed in the numbered aquariums. We notice many different reactions of the fish. Some of the fish jump. Other fish try to hide. Still other fish come to the top of the water as if gasping. All of these reactions are noted and recorded.

After 24 hours, we enter the laboratory to check our results. Some of the fish have lived; some have died. We are interested in the aquariums which contain enough herbicide to give one of the following results: all of the fish lived, exactly

one-half lived or all died. The aquariums in which the herbicide killed exactly one half of the fish is the one which tells us the most. When all of the fish die, we know we've used too much herbicide. When all of the fish live, we might have been able to use more. When only half of the fish live, we can determine exactly how much herbicide is safe to use.

It is important to remember that not all herbicides kill fish immediately. Some fish are killed over a week after the herbicide is added. The bioassay tests are carried on for as long as necessary. In this way, we find out if fish would be killed after the first day.

Chemical companies have been very helpful in this work. They have supplied samples of their herbicides free of charge. This includes not only herbicides on the market, but also experimental herbicides. For this reason, we are able to make recommendations on new materials as soon as they can be bought.

Our test results show that there are many herbicides that can safely be used in ponds. One of these is 2,4-D. It has been in general use for many years. Fishkills can be caused by 2,4-D, due to either poor spraying, improper type of 2,4-D or both. Two types of liquid 2,4-D are available; ester and amine. The ester types such as Esteron 99, Weedone 48, etc. are more likely to kill fish than the amine types such as Weedar 64, Dow Formula 40, Weed Rhap, etc.

On most aquatic weeds, amine 2,4-D is equally effective as ester 2,4-D and usually recommended. On those kinds of weeds where ester types are necessary, ordinary care in spraying will reduce fish kills.

2,4-D pellets are sold under a variety of trade names: Aqua Kleen, Chem Pels, and Weed Rhap 20. Actually, these pellets are simply clay particles sprayed with ester 2,4-D and dried. These pellets when put in a pond, sink to the bottom and the 2,4-D is slowly released from the pellets. This treatment method is very effective on many aquatic plants. It is much more expensive to use 2,4-D pellets than to use liquid 2,4-D. For this reason, they are not widely used. Our tests show that most of the 2,4-D pellets when used as directed will not kill fish.

Though usually sold as a brush killer, 2,4,5-T is sometimes used on aquatic weeds. It is sprayed on willows and other brushy type plants near the edge of the water. As this herbicide is usually not sprayed in the water, the number of fish kills recorded have been few. It is more apt to kill fish than 2,4-D, but care in spraying reduces this danger.

Silvex is another herbicide which is being used for aquatic weed control. It is sold under a variety of trade names such as Kuron, Kurosai, and Silvi Rhap. Silvex is often recommended for spraying cattails. When mixed with other chemi-

cals, some control of alligator weed is noted. It must be used very carefully if fishkills are to be avoided. At present, Kurosai is the least toxic of the silvex herbicides tested.

Endothal, which is sold under the trade name of Aquathol, is a very effective herbicide on underwater weeds, commonly called moss. A very small amount is required to control underwater weeds. Fish are very hard to kill with this herbicide and no fishkills have been reported.

Other herbicides, which have been tested and found safe when properly applied, are Fenac, Diquat, Dalapon, Amitrol, Banvel D and Casoron. Most of these are not for sale at this time. All of them can be used on water weeds, but reasonable care is necessary.

In the near future, the bioassay project will be expanded. Ponds are to be constructed in the Monroe area. After a herbicide has been checked for toxicity to fish, this herbicide will be tested in a pond. At this time, we will determine the effect of the herbicide on fish foods. We will also find out the herbicide's effect on the reproduction and growth of fish. From these studies, we will be able to determine when a herbicide is safe to use on water weeds. our herbicide bioassay laboratory. We are still working to find out why things happen. Our

advice is, if you want to use herbicides on the weeds in your pond, please contact a fisheries biologist in your area. He can give you detailed recommendations.

WEED CONTROL INVESTIGATIONS

After herbicides have been screened under the bioassay project work plan, they are put into field tests. Two types of tests are conducted. When available, total water treatment in ponds is the preferred method. For those weeds that occur primarily in lakes, 1/100 acre plots are used for preliminary screening.

Herbicides for use in these field tests are provided through the courtesy of their manufacturers. As most herbicides are designed primarily for terrestrial applications, aquatic usage must be based on what is available. At the present time, few manufacturers have a material that is designed with aquatic vegetation control as its major use. The reasoning behind this is simple; the market is too limited to pay for the cost of development of such a new herbicide.

The following table presents recommended dosage rates for control of specific aquatic plants. These recommendations are based on research conducted prior to this year.

<i>Name of Plant</i>	<i>Chemical</i>	<i>Application</i>	<i>Remarks</i>
Emergent cattail (Typha)	Dalapon	20#/acre	Dilute in water
	Amitrole	15-20#/acre	Dilute in water
Bulrush (Scirpus)	2,4-D ester	4#/acre	Dilute in water
Water primrose (Jussiaea)	2,4-D amine	4#/acre	Dilute in water
Water hyacinth (Eichornia)	2,4-D amine	4#/acre	Dilute in water
Alligator weed (Alternanthera)	2,4-D amine	4#/acre	If on dry ground
	Silvex	8#/acre	In shallow water
Pennywort (Hydrocotyle)	2,4-D amine	4#/acre	Spray to wet
Water shield (Brasenia)	2,4-D granular	100#/acre	
	2,4-D ester	4#/acre	Use wetting agent
White waterlily (Nymphaea)	2,4-D ester	4#/acre	Use wetting agent
	Silvex	4#/acre	Use wetting agent
Yellow water lily (Nuphar)	2,4-D ester	6#/acre	Use wetting agent
	Silvex	6#/acre	Use wetting agent
Yonkopen (Nelumbo)	2,4-D ester	6#/acre	Use wetting agent
Arrowhead (Sagittaria)	2,4-D amine	4#/acre	Dilute in water
	Diquat	1 gal./acre	Dilute in water
Duckweed (Lemna)	Diquat	1 pt./acre	Spray on surface
Water lettuce (Pistia)	Diquat	1 gal./acre	
Submergent algae	Copper sulfate	2 ppm	Use with care
	Diquat & Paraquat	1 ppm	
Parrots feather (Myriophyllum)	Endothal, 2,4-D	5 ppm	
	Diquat	2 ppm	
Waterweed (Elodea)	Diquat	1 gal./acre	
Coontail (Ceratophyllum)	Endothal	3 ppm	
	Diquat	1-2 gal./acre	
Musk grass (Chara)	copper sulfate	2 ppm	Use with care
Naiad (Najas)	Endothal	3 ppm	Deep water requires
	Diquat	1-2 gal./acre	higher rate
Bladder wort (Utricularia)	Diquat	0.5-1 gal./acre	
	Endothal	2 ppm	
Fanwort (Cabomba)	Endothal	5 ppm	
Narrow leaf pondweed (Potamogeton)	Diquat	0.5 ppm	
	Endothal	2 ppm	
Broadleaf pondweed (Potamogeton)	Endothal	2 ppm	
	Diquat	0.5-1 ppm	

Experiments were conducted on the control of cattail in shallow water in three locations during the year. Amitrol-T was found to be effective in the control of this plant at the rate of 10-15 pounds per acre. All of the chemicals recommended are most effective prior to the bloom stage. After this time control was generally poor. Two tests were applied in late fall. The cattails were cut early in September. The plants were then sprayed when they reached a height of 8-16 inches early in October. Both dalapon and amitrol-T were extremely effective when used under these growth conditions.

The control of filamentous algae was studied in three locations during the year. The diquat and paraquat treatment previously recommended was not effective on at least three of the species present. The use of sodium arsenite is not recommended for the average pond owner. At 2 ppm it was effective on the species of filamentous algae present. One pond was treated in sections using Hydrothol 47. No fishkill was noted and at no time did the total concentration in the pond exceed 0.01 ppm. Control was excellent. Two ponds were treated using $\frac{1}{4}$ pound of diuron per surface acre. In each of these ponds good control of the filamentous algae was obtained. Species present included *Gladophora*, *Spirogyra*, and *Hydrodictyon*.

Experimental results indicate that diuron at 1 pound per surface acre is effective in the control of Chara. Diuron is not recommended for use in farm ponds because its low water solubility makes contamination of water areas below the spillway of the pond probable.

Some studies have been conducted in the use of aquathol plus to replace aquathol. The primary reason advanced for this substitution is that the addition of the silvex will give a better residual for weed control. For farm ponds, this is not recommended. If aquathol will control the weeds, the addition of fertilizer will screen out the light. Therefore, no new infestation of aquatic vegetation usually occurs. If silvex is required to control the weed species present, it should be used alone, as the addition of aquathol makes the treatment more expensive. The combination of aquathol and silvex is another example of the present trend toward a shotgun approach to aquatic weed control.

One important lesson was learned during the year. The use of herbicides on water bottoms which will subsequently be used for the production of field crops is to be discouraged. Herbicide residues may seriously curtail production. Fenac was applied at the rates of 10, 15 and 20 pounds per acre to a dry lake bottom in an effort to control aquatic vegetation. The experimental rates failed to control the aquatic vegetation present. When soybeans were planted in the lake bottom one year later, the plants failed to spout in most

of the plots. In areas where sprouting occurred the plants died at the 2 or 3 leaf stage. The soybeans in a 20 foot band around the $\frac{1}{20}$ acre plots showed the typical epinastic effects of fenac poisoning. At present we are also assaying the effects of applying diuron to a pond bottom and subsequently planting soybeans.

HERBICIDE RESIDUE STUDIES

This study was designed to determine the effect of two herbicides (diquat and paraquat) on weed control, fish production, fish food production, water chemistries, and residues in fish flesh.

Fifteen ponds were selected on the basis of size and fish population present for this study. Method of treatment varied among the ponds. The application of the chemicals was done at single application rates and repeated application rates. Six were treated with one part per million diquat on April 1, 1964, and six ponds were treated with one part per million paraquat on April 1, 1964. The remaining three ponds were used as untreated controls. On August 1, 1964, three of the diquat treated ponds received an additional one part per million of diquat and three of the paraquat treated ponds received an additional one part per million of paraquat.

Aquatic vegetation varied among the ponds. The predominant species present were southern nanad, musk grass, filamentous algae and three species of pondweed. The extent of control was ascertained biweekly. It was apparent from the data collected that the control of weeds was much better in the spring months than after the applications in the summer. In four ponds the weed growth was extremely dense and control was poor. In the other ponds, control was somewhat better, but still left something to be desired in the summer months. On the basis of this data, the use of either diquat or paraquat is not recommended after mid-July.

The water quality studies were done in three phases. Field chemistries were taken each time samples were procured. A composite one gallon water sample was returned to the Monroe Office. Two quarts were set aside to be forwarded for residue analysis. One quart was analysed using standard water quality procedures.

The variations from pond to pond in the chemical analyses are so wide that they generally force the writer into the only general statement, and that is no effect noted. There does appear to be a slight depressant effect on the dissolved oxygen content. The reason for this is not readily apparent but may be due to a die-off of plankton. There is also some disturbance of the balance of nitrogen in the water, particularly with the paraquat. The mechanism behind this shift is not immediately apparent. From these data we are led to the conclusion that neither material demonstrated

deleterious effects within the parameters sampled. The depressant effect on the dissolved oxygen could be of importance under certain conditions, however.

Residue analyses were conducted by California Chemical Company through a contract laboratory. It is not immediately apparent why the concentration of diquat exceeded one part per million on the first day after treatment. The most logical explanation is, the high plankton concentration held the diquat in the upper strata of water. In these early treatments all ponds showed an absence of residue by the thirteenth day. In the re-treatments conducted in late July, there was no problem occasioned by high phytoplankton counts. At the same time it is noted that the residues in the water were still present in all ponds on the eighth day and in one pond through the fourteenth day. This is also expected. The absence of phytoplankton which would carry the chemical to the bottom as it dies may have allowed the chemical to remain in the water column. Another possibility is, of course, a build up of chemical in the pond.

The standing crop of benthos in the study ponds was sampled through the use of a Petersen dredge. This dredge measured 0.67 square feet of bottom area per sample. Three samples were taken in each pond on each sampling day. These samples were taken in the shallow end of the pond which normally varied from 1.5 to 2.5 feet deep. The data indicate only minor effects on the standing crop of benthos. These data when subjected to normal statistical evaluations revealed no significant differences between the control ponds. There is no evidence to indicate that the effect of diquat or paraquat increases either the Tendipedidae or Tubificidae. For these reasons we conclude that these herbicides either do not affect benthic populations or that present analysis procedures are too gross to measure the effects.

The amount of residue of diquat present in the benthic organisms is available from only 4 determinations. Other samples taken were not analyzed. Dragonfly larvae (Odonata) contained 0.63 ppm diquat cation 13 days after the application of diquat. As these insects are predaceous bottom dwelling species, this may account for the high concentration found in their bodies. It should be noted that this exceeds the amount of diquat found at this interval in any other flesh after a single application of diquat. Mixed benthos which included Tendipedidae larvae, *Tubifex*, snails and other miscellaneous organisms averaged 0.20 ppm diquat cation after the thirteenth day. This concentration had dropped to 0.04 ppm by the 28th day. Here again this exceeded the concentrations found in fish flesh on the same days. No evidence is available at this time as to the effects on fish

eating these herbicide from laden benthic organisms.

As fish are the end products in the management of most ponds, the effect on them is of paramount importance. In an effort to determine the effects of paraquat and diquat on fish, 15 ponds containing various fish crops were tested.

In Experiment One, golden shiners, *Notemigonus chryssoleucas*, were used as test fish. The effect on fry and fingerlings was the most important aspect. Eggs on spawning mats were placed in the ponds between March 10 and April 15, 1964. The ponds were stocked at the rate of 60 mats per acre which should have yielded approximately 60,000 eggs. The fish were removed from the pond between July 1 and July 10, 1964. It should be noted that the fish in the diquat ponds varied in weight from 4 to 8 pounds per thousand. Those in the paraquat ponds varied in weight from 2 to 4 pounds per thousand. In the 12 control ponds the fish varied in weight from 0.5 to 6 pounds per thousand.

In Experiment Two, the primary effort was directed toward determining the effect on larger fish. The fish stocked in these ponds were from 0.5 to 3 pounds per thousand in size. The average stocking rate was 100 pounds per acre. The fish were taken out at the end of varying periods of time from 26-75 days. At this time they were all in the salable size ranges of 4 to 6 pounds per thousand. As in Experiment One the fish were fed heavily during this entire period. Due to the inadequacy of feeding records, it is not possible to calculate the food conversion ratios. From statements obtained from the hatchery personnel, it is probable that all fish received an adequate amount of feed for rapid growth.

The results of Experiment Two indicate that both diquat and paraquat had a depressant effect upon the growth of the golden shiners. Due to the difference in growth rate in all fish between the spring months and the summer months, two sets of controls are presented. In each case the controls show better growth than the herbicide treated ponds.

Experiment Three was to determine in part the effect of diquat on channel catfish, *Ictalurus punctatus*, fry. The catfish fry were placed in a pond between May 15 and June 15, 1964. This pond had previously been treated in April with 1 ppm diquat. The pond was then treated with 1 ppm diquat in July. The results from this test indicates that the use of diquat on channel catfish fry should be done with caution.

The effect of two treatments of paraquat on the growth of channel catfish was tested in Experiment four. These data seem to indicate that there was a depressant effect upon production. As this is the result of a single test against a single control, it is not intended that this should be a basis for final conclusions. It is, however, indicative that more care and further testing should

be done before recommending the use of this herbicide in high production ponds.

The amount of residue retained in fish flesh was determined from collections made at the field station. Analyses were to be performed by California Chemical Company. A post collection decision by the company resulted in the residues of paraquat in the fish flesh not being determined. As these residues were measured on the whole fish, it is not immediately possible to determine what portion of this would be in the edible parts. One other thing to be noted the second treatment caused much higher residues to appear in the fish flesh than the single treatment. These residues were also higher than those found in the water.

The effects of diquat and paraquat on fish and fish food organisms and water quality were determined in this study. On the basis of this single year's data, a depressant effect on fish production is probable. Therefore, it is recommended that this study be continued under more closely supervised conditions in an attempt to substantiate these findings. Until more definitive measures of water quality and benthic production are devised, these parameters should not require reexamination.

Technical Publications Completed During 1964-1965

Davis, James T., Janice S. Hughes, and Harry E. Schafer, Jr. 1964. Water level fluctuation to control aquatic vegetation. *Proc. Sou. Weed Conf.* 17:328.

_____ and Janice S. Hughes. 1965. Results of creel census on four north Louisiana lakes. *Proc. S. E. Assoc. of Game and Fish Comm.* (In Press).

_____ and Janice S. Hughes. 1965. Effects of impoundment on the benthic population of Bayou D'Arbonne, Louisiana. *Proc. S. E. Assoc. of Game and Fish Comm.* (In Press).

Hughes, Janice S. and Neil H. Douglas. 1965. Movement of native and stocked fish in D'Arbonne Lake after impoundment. *Proc. S. E. Assoc. of Game and Fish Comm.* (In Press).

Lantz, Kenneth E., James T. Davis, Janice S. Hughes, and Harry E. Schafer, Jr. 1964. Water level fluctuation—its effect on vegetation control and fish population management. *Proc. S. E. Assoc. of Game and Fish Comm.* (In Press).

AN INVESTIGATION OF THE SPORT FISHERIES IN COASTAL WATERS OF LOUISIANA

DINGELL-JOHNSON PROJECT F-8-R

WENDELL LORIO
CHARLES HOENKE
Fishery Biologists

This project was designed to obtain pertinent



A collection of spotted seatrout caught in one of the trammel net samples. These fish are to be weighted, measured, and sexual development checked. The stomachs are also removed for later analysis.

biological information pertaining to sport fisheries along the Louisiana coast. Such biological information as abundance, movement patterns, environmental requirements, spawning and food habits of the game species present will be derived from the data that has been collected, together with future data. The area under study is the Biloxi Marsh area located in southeastern Louisiana (see map). The project has been conducted since 1960 and is scheduled for completion June 30, 1966.

The following is a breakdown of the different objectives of the project and an explanation and progress report of each.

Trammel Net Samples

Fish sampling by use of a 200 yard trammel net was one phase of Project F-8-R. This gear was used to collect large fish in five major areas of sampling.

The 200 yard trammel net has proven to be most successful when used as a seine. This is accomplished by anchoring one end of the net to the shoreline, then laying the remainder of the net in a circle bringing the second end back to the original point of anchor. This forms a circle with no route of escape for fish within the net. With the circle being completed, a disturbance is created within the net causing the fish to become entangled. The net is now picked up and the fish removed for examination. Game fish are weighed, measured and examined for gonadal development; rough or non-game fish are only measured.



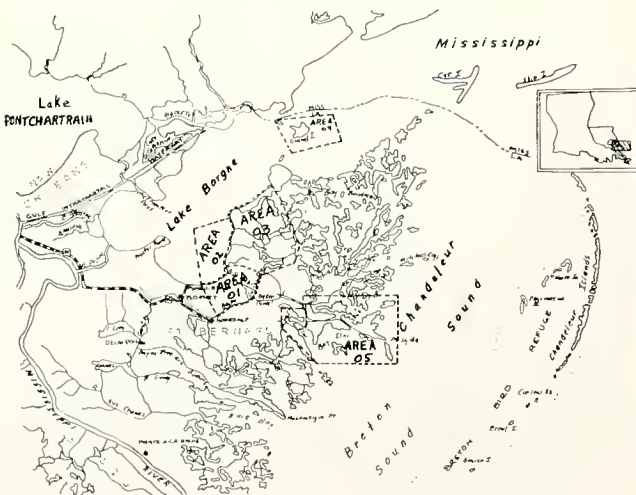
A tagged redfish is shown here prior to releasing.

There was a total of 12,629 fish collected from July 1, 1963-June 30, 1965. Of this total 2,900 were considered game fish and 9,529 were rough fish. The majority of the fishes sampled were during the warmer months of the year.

Preceding each trammel net sample, water chemistries were run to determine the limnological characteristics of the water at the time of the trammel net samples. Tests were made to determine the parts per million (ppm) of carbonates, bicarbonates, and dissolved carbon dioxide in the water. Salinities were determined in ppt. Air and water temperatures were recorded in degrees centigrade and secchi disc measurements were taken to determine apparant water turbidity. Two water samples were taken with each sample, preserved with magnesium chloride and brought to the New Orleans laboratory. Turbidity and chloride tests were run on these samples. The averages for the two years of water analyses are shown in Table I.

Sampling of Invertebrate Populations

The sampling of invertebrate populations was done every nine weeks in the sampling areas



shown on the map for the trammel net samples. The samples were taken with a sixteen foot and six foot bobbnet otter trawl.

The sixteen foot otter trawl is dragged for five minutes behind an outboard flatboat. The contents of the samples were then identified to species, measured and recorded. These trawl samples collect organisms that were not ordinarily caught in the trammel net. These samples give a general picture of the smaller biotic organisms present in the different areas at a given time of the year. These data combined with the trammel net samples serve as an indication of the over all population in these estuarine areas except for micro and semi-micro organisms.

The six foot bobbnet trawl samples were taken when stomachs were obtained from game fish collected in the trammel net samples. The bobbnet samples were made in the exact area of the trammel net samples and immediately preceded it. Bobbnet trawl samples represented one minute drags. The contents of the samples were preserved in formaldehyde solution and brought to the laboratory where they were identified, measured, and recorded. This information was used to correlate the feeding habits of fishes examined with the food organisms that are available for that particular species at that time.

Stomach Samples

Stomach samples were taken approximately every nine weeks to determine the feeding habits of spotted seatrout, *Cynoscion nebulosus*; redfish, *Scianops ocellata*; croaker, *Micropogon undulatus*; and the southern flounder, *Paralichthys lethostigma*. As to this date data collected have not been completely analyzed for the species other than the spotted seatrout. The results of this study show that the spotted seatrout was predaceous in its feeding habits. They feed mainly on



An aerial view of a portion of the Biloxi Marsh area. Lake Borgne is the body of water in the upper right hand corner.



From the shoreline outward is one of the trammel net sample areas.

fishes such as croakers, spot (*Leiostomus xanthurus*); mullet (*Mugil cephalus*); menhaden (*Brevoortia sp.*) and on crustaceans such as shrimp (*Penaeus sp.*) and blue crabs (*Callinectes sapidus*.)

Fish Tagging

During the last two years 496 fish have been tagged. The species of fish tagged were spotted

seatrout, sand seatrout (*Cynoscion arenarius*), red drum, black drum (*Pogonias cromis*); the majority of which was spotted seatrout. These fish were tagged to obtain data pertaining to longevity, habits and migration or movement patterns of the different species mentioned above.

Of the total number of fish tagged only ten returns have been made to this office. Very few facts can be hypothesized from such limited data; however, a few statements may be made. The returns that have been received were from fish that had been tagged 1-5 weeks earlier and were usually caught in the immediate release area. From this it can be assumed that the tagged fish had moved completely out of the area or that the attached tag was sloughed off after 5-8 weeks. The latter seems to be the reasonable explanation for the few tag returns.

In the future, attempts will be made to double the tagging efforts and also experiment with new types that would not be so easily lost.

Table I
WATER CHEMISTRY'S AVERAGES JULY 1963-JUNE 1965
BILOXI MARSH AREA

Temp. °C	01-06	02-02	03-09	03-10	04-04	04-05
Air	24.94	23.45	26.01	26.54	26.33	24.78
Water	27.41	22.10	22.55	22.50	21.16	22.56
Alkalinity (ppm)						
Crab.	0	0	0	0	0	0
Bicarb.	70.80	48.15	52.61	49.50	47.83	59.47
Total	70.80	48.15	52.61	49.50	47.83	59.47
pH	8.21	8.18	8.09	8.02	8.44	8.10
CO ₂ ppm	3.16	3.29	3.46	3.93	2.14	3.34
Chloride ppm	6,681.2	4,122.4	7,969.9	4,106.0	7,783.4	10,914.5
Salinity ppt	11.4	5.54	7.97	5.67	11.85	14.97
Turbidity	26.0	28.0	31.7	26.65	42.0	30.5
Secchi disc in feet	2.02	1.94	2.01	1.47	2.00	1.48

AN ECOLOGICAL SURVEY OF FACTORS
AFFECTING FISH PRODUCTION IN A
NATURAL LAKE AND IN A RIVER

DINGELL-JOHNSON PROJECT F-11-R

KENNETH E. LANTZ
Fisheries Biologist

Project F-11-R was inaugurated in July, 1964 to establish what ecological conditions affect the production of fish and fish food organisms in a lake and river habitat. The project consists of six different jobs and when completed in June, 1967 should give needed information as to normal aquatic conditions of Lac des Allemands and the Sabine River.

Lac des Allemands is located in southeast Louisiana in St. John the Baptist, Lafourche, and St. Charles Parishes. The lake is approximately twenty-four square miles in area and has an ill-defined shoreline of thirty miles of fertile swamp and marsh. This shallow wind swept area is subject to periodic tidal effects of water movement from the Gulf through Barataria Bay, Little

Lake, and Lake Salvador. It is virtually a fresh-water lake, except during unusually high tides that accompany storms and hurricanes moving inland from the Gulf.

The lake annually produces high yields of game and commercial fish species. Exceptional crappie and bass fishing are experienced by area fishermen during the early spring and fall of each year. Sport fishing for catfish species is unusual in most Louisiana Lakes, but is a common practice at Lake des Allemands during late spring.

As important as this lake is for sportfishing and recreation, it is even more important from the standpoint of production of commercial fish species. A survey in 1964 by fisheries personnel indicated more than 2,500,000 pounds of catfish were bought by wholesale fish buyers from this area during that year. This represents a minimum poundage because 1964 records were not available from all of these buyers. Whereas, catfish production has steadily declined in most areas of the state, the Lac des Allemands catfish production has maintained itself for years under heavy fishing pressure by sports and commercial



Lake survey crew working up fish collected from Lac des Allemands from the blocked off one acre area in the background.

fishermen. Factors influencing fish production in this area will be studied closely during this project.

The river habitat under study is the Sabine River which drains the infertile pinelands of eastern Texas and western Louisiana, and serves as a natural boundary separating these two states. To date, very little information is available in the literature concerning fish populations and production in this drainage. Recently, interest has been expressed in the present fisheries of this area due to construction of a hydroelectric dam on the river at mile 156.5. This dam will be located approximately eighteen miles west of Leesville, Louisiana and will impound 198,000 acres at full pool stage and inundate 265 miles of the river and 133 miles of its tributaries upon its completion in 1969.

Fish Population Studies

The purpose of this job is to determine what species of fish are present in both study areas and the production per acre in selected areas. Sampling gear include rotenone and one acre block off nets, gill and hoop nets and various types of traps. Data being collected include annual production of fish per surface acre of water, age and growth of certain species, and seasonal movements of some species.

Fish population samples from Lac des Allemands in June, 1965 showed a production of 73.2 pounds of fish per acre of water. Fifty percent of this total poundage was channel catfish, thus confirming data mentioned earlier concerning the economic significance of the commercial fisheries of this area. A tagging program was also initiated in June, 1965 to follow movements of catfish species in Lac des Allemands and its associated waters.

Population studies from the Sabine River are incomplete for 1965, but will include use of various types of webbing, traps, and limited use of rotenone. Follow up studies of the survival and

movements of introduced striped bass, *Morone saxatilis*, will also yield data from the river as to movements of other fish species.

Fish Food Studies

Fish stomach analyses from various species of fish are conducted seasonably to determine the kind and number of organisms eaten. With this information, fisheries personnel learn the preferred food of the fish in the two areas. Correlation of feeding habits with the abundance of food organisms can be made using stomach data and information obtained from benthos and plankton studies.

Plankton Studies

Monthly checks are made of the kinds and abundance of small plant and animal organisms (plankton) found swimming free or floating in the water of the two study areas. These organisms are the first in a series of aquatic food items eaten by fish. Plankton is of great importance in the diet of young fish. The success or failure of a fishery is influenced directly by the abundance and distribution of plankton.

Bottom Fauna Studies

Bottom fauna includes all organisms living on or in the bottom of a body of water. This benthos constitutes a large portion of the diet of many game and commercial fish species. Benthos sampling is monthly at Lac des Allemands and quarterly at the Sabine River collecting stations.

Following dredging and washing of mud samples, the number and weights of the organisms are recorded for later comparison with fish stomach data.

Physical and Water Chemistry Studies

Each month chemical analyses are conducted for the amount of dissolved oxygen, free carbon dioxide, alkalinity, and pH at predetermined stations in the study areas. These analyses are checked in the field, while water samples are also collected and returned to the New Orleans laboratory for tests of total and available phosphates, ammonia nitrogen, nitrate nitrogen, and nitrite nitrogen. Physical factors also recorded are turbidity, color, and air and water temperatures.

All of the above mentioned factors either have a direct or indirect effect upon the production of fish and fish food organisms in a body of water.

Young Fish of the Year Studies

The objectives of this job are to determine the annual spawning success of the fish populations in the two areas and to compare success of spawning between game and rough fish species. These reproduction samples are taken in early summer utilizing small mesh bobbnet seines.

LOUISIANA COOPERATIVE FISHERY UNIT

R. ONEAL SMITHERMAN
Leader

WILLIAM H. HERKE
Assistant Leader

BRYANT A. BATEMAN
LESLIE L. GLASGOW
ROBERT J. MUNCY
Faculty Collaborators

Introduction

The Louisiana Cooperative Fishery Unit was established on June 26, 1963, with the signing of an agreement by representatives of Louisiana State University, Louisiana Wild Life and Fisheries Commission, and the Bureau of Sport Fisheries and Wildlife.

Mr. William Herke assumed the position of Acting Leader on June 26, 1963, and carried out organizational duties until February 27, 1964. On this date, Dr. R. Oneal Smitherman became Unit Leader.

The Unit is located in the School of Forestry and Wildlife Management, Baton Rouge campus, Louisiana State University. A large classroom (32 x 22 feet) was partitioned to provide offices for the Unit Leader, Assistant Unit Leader, the Leader of the Cooperative Wildlife Unit, and a secretary who serves both Units. A laboratory and classroom (16 x 22 feet) is provided primarily for fishery classes and for fishery research. Office space is furnished for six fishery graduate students.

Three storage sheds (each 10 x 22 feet) are assigned for the Unit's use. A departmental research greenhouse and storage building is used in part for fishery research. Located on University property and available for fishery research are a 16-acre pond, a 4-acre pond, and eleven earthen ponds ranging from 0.06 acre to 0.22 acre in surface area.

Major items of equipment owned by the Unit include: 19-foot MFG boat with a 100-horsepower Volvo inboard-outboard power unit; 14-foot aluminum flatboat; 3-16-foot aluminum flatboat; three outboard motors; electric shocker and pulsator; airboat; portable salinity and temperature meter; compound and dissecting microscope; desk calculator; station wagon, pick-up, and jeep. University vehicles, boats, and outboard motors may also be used as needed.

All other facilities of L.S.U. are available for Unit use in the same manner in which they are available to other departments.

Of importance to the Unit is the affiliation of L.S.U. with the Gulf Coast Research Laboratory, Ocean Springs, Mississippi. Through this affiliation students may take summer courses in marine



R. ONEAL SMITHERMAN
Unit Leader

biology and geology. Graduate credit can be obtained for six hours in marine geology, four hours in marine botany, and twelve hours in marine zoology.

Through appropriate arrangement, most of the facilities of the Louisiana Wild Life and Fisheries Commission can be made available for cooperative studies with the Unit. The same is true of four National Wildlife Refuges in Louisiana.

Louisiana has tremendous fishery resources in streams, stream overflow areas, salt and fresh marshes, and estuaries. Present knowledge is less than adequate for proper management of these resources. Consequently, major emphasis of the research program of the Louisiana Cooperative Fishery Unit shall be in the area of fisheries ecology, with particular reference to estuarine environments, stream overflow areas, and oxbow lakes. Ecology of Louisiana crawfishes will constitute a substantial portion of the program, inasmuch as crawfish apparently represent an important link in the food chains of Louisiana fishes and wildlife. Crawfishes also contribute importantly to the sport fishery of Louisiana. Programs to provide better management techniques for Louisiana fishes will receive immediate attention. A program in fish physiology and pathology will be developed at a less accelerated rate.

Research Program

UNIT LEADER ACTIVITIES

The Unit Leader has been largely concerned with organization and student research programs during 1964. A cooperative bluefish tagging program has been undertaken with personnel at the Sandy Hook Marine Laboratory, Bureau of Sport Fisheries and Wildlife, and with personnel of the Louisiana Wild Life and Fisheries Commission. The Sandy Hook Laboratory supplies tags, the Commission sometimes provides transportation

offshore, and the Unit supplies manpower to accomplish the tagging. Thirty bluefish marked with spaghetti tags and released off Rockefeller Refuge in early November, 1964, represent the start of the first such tagging program in the Gulf of Mexico.

Materials and equipment have been acquired for a project to determine standard hematocrit values for warm-water fishes. Sampling will be done monthly throughout 1965 from blood of bluegills and largemouth bass to determine effects of age, season, temperature, and sexual maturity upon hematocrit.

ASSISTANT UNIT LEADER ACTIVITIES

Water levels in the Louisiana coastal marsh have been stabilized over vast areas by construction of low-sill wooden weirs. These are structures placed across the mouths of tidal creeks with the crest slightly below marsh ground level. Water flows over the weirs at high tide but is prevented from flowing out when the tide recedes below crest level. The resulting water level stabilization causes vegetation changes beneficial to waterfowl and cattle. However, little is known concerning the overall effects of these structures upon the fish resources associated with the marsh. The Assistant Leader's research problem will be to determine some of these effects.

The Assistant Leader has begun steps to prepare himself for the study and to better delineate the problem.

A six weeks summer course in marine vertebrate zoology and ichthyology was completed at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi. He has passed the graduate reading test in German and courses in animal physiology and in an invertebrate zoology. Literature research on estuarine ecology was also begun.

Several areas under water level control were investigated as potential research areas, The Biloxi Public Shooting Area (under lease by the Louisiana Wild Life and Fisheries Commission) was selected as best suited for the study. Commission approval has been received to conduct the study on this area and use Commission facilities while there.

Work thus far has been directed toward developing suitable sampling methods in the area, especially for juvenile fishes. Many of the usual methods can not be used because of the extremely soft bottom and large amounts of organic debris.

Selection of a project title and specific problem objectives will await further preliminary investigation. However, in general, the plan is to take periodic quantitative samples of fishes from areas in which weirs control the water level and from similar areas without weirs. Other data will

be collected as further investigation proves warranted.

STUDENT ACTIVITIES

The Biology of the Brown Shrimp, *Penaeus aztecus*, in Impoundments

Personnel

Wendell J. Lorio—Graduate Assistant
R. J. Muncy—Supervisor

Progress

Mr. Lorio was awarded the degree of Master of Science in fisheries on January 28, 1964, after receiving financial aid from the Unit for five months. An abstract of his thesis is presented below. His thesis research was submitted and accepted for publication in the Proceedings of the Eighteenth Annual Conference, Southeastern Association of Game and Fish Commissioners.

Abstract

During 1962 and 1963, six one-third acre ponds were stocked with brown shrimp (*Penaeus aztecus*) to determine biological factors such as growth, mortality and food habits. The ponds were filled, then poisoned to remove predatory fish and crabs. Juvenile brown shrimp were caught with a beam trawl in the Rockefeller Headquarter's Canal, counted and stocked in the ponds at predetermined densities. Five different stocking rates were used in 1962, and two in 1963. Statistical analysis showed that there was no difference at the 5 per cent level of significance between stocking rates and over-all growth. In 1963, three conditions were tested for each stocking rate. They were feeding of shrimp, presence of wild fish populations, and stocking with mullet. Statistical analysis showed that there was no significant difference at the 5 per cent level between growth of the shrimp and the three conditions at the stocking rates.

The shrimp were sampled bi-weekly and measured in millimeters to determine the average size and the growth from one sample to the next. The shrimp exhibited rapid early growth with a general decline in growth toward the end of the experiment. In the fall, all shrimp were harvested, weighed, and measured to determine the average size and the per cent mortality. The average size of the shrimp harvested was 45 count per pound. Mortality, which was very high from the third week in August to the time of harvest ranged from 73 to 100 per cent.

Stomach analysis indicated that shrimp ate invertebrates, vegetation, diatoms, algae and debris. Invertebrates were found more frequently in the diet of larger shrimp and vegetation decreased in importance. Many of the shrimp stomachs were empty.

PROJECT REPORTS

Ecological Factors Affecting Distribution and Abundance of the Centrarchids of the Recent Delta of the Mississippi River

Personnel

Dudley C. Carver—Graduate Assistant
R. J. Muncy—Supervisor

Fund

Bureau of Sport Fisheries and Wildlife (Research Contract to L.S.U.)

Progress

Mr. Carver completed requirements for the degree of Master of Science in fisheries in May, 1965, and is presently employed as a district fishery biologist with the Louisiana Wild Life and Fisheries Commission. An abstract of his thesis is presented below.

Abstract

Ecological factors affecting distribution and abundance of eight centrarchid fishes were studied on Delta National Wildlife Refuge from August, 1963 through January, 1965.

Gear used to collect the fish included rotenone, gill nets, trammel nets, bag seine, minow seine, and electric shocker. Standing crop samples were conducted using rotenone and block-off nets.

Salinity was a major factor which limited distribution of centrarchids on the refuge. Pond depth and turbidity were also factors affecting distribution and abundance. Oxygen, carbon dioxide, pH and alkalinity were found to be within suitable levels for fishes during sampling periods.

Spotted sunfish had the most diversified distribution of any centrarchid. Largemouth bass preferred the clearer, deeper waters. Warmouth occurred in more turbid waters than other centrarchids.

Scale examination revealed three age groups of largemouth bass and six age groups of black crappie. Length-frequency histograms of other centrarchids indicated short life spans. Growth rates of centrarchids from the delta study were greater during the first year than those reported for the same species in other areas of the United States. Maximum total lengths were not as great as reported for the same species in more northern locations.

Coefficient of condition (K) compared to other studies indicated centrarchids in the delta were in excellent body condition.

Centrarchidae represented the second largest family in number of species and first in poundage of fishes occurring on the study area. Redear sunfish, warmouth, spotted sunfish, black crappie, and largemouth were the most abundant centrarchids, respectively.

A Taxonomic Survey of the Fishes of Delta National Wildlife Refuge With Emphasis Upon Distribution and Abundance

Personnel

John R. Kelley, Jr.—Graduate Assistant
R. J. Muncy—Supervisor

Funds

Bureau of Sport Fisheries and Wildlife
(Research Contract to L.S.U.)

Progress

Mr. Kelley completed requirements for the Master of Science in fisheries in May, 1965, and is presently working toward the Ph.D. in fisheries at Auburn University. An abstract of his thesis is presented below.

Abstract

This study was conducted on Delta National Wildlife Refuge, situated in the estuarine portion of the Mississippi River from August, 1963 to February, 1965. Determinations were made of fish distribution, abundance, and relationships to salinity and temperature.

Collections were made with an electric shocker, gill and trammel nets, otter trawl, and rotenone. Block-off nets and rotenone were used to determine standing crop. Water analyses, including salinity and temperature, were recorded at the sampling locations.

A definite relationship of abundance and distribution was evident between fresh water fishes and salinity; however, salinity was not found to be a limiting factor to most marine species. Accessibility to ponds and temperature were found to be the controlling factors relating to distribution, abundance, and seasonal occurrence of marine fishes.

Fishes collected represented 33 families and 79 species. Calculated from standing crop samples, Sciaenidae was the most abundant family of marine fishes and Centrarchidae was the most abundant fresh water family. Striped mullet and blue catfish were the most abundant species.

The study area is being used as a nursery ground for several marine species. Young of Atlantic croaker, spot, sand seatrout, spotted seatrout, and largescale menhaden were present seasonally throughout the study area. Adult marine species encountered on the refuge containing ripe eggs or young were Atlantic needlefish, Atlantic stingrays, bluntnose stingrays, and gulf pipefish.

Standing crops of fishes within the study area varied from 1.22 to 258.82 pounds per acre. Ponds south of Main Pass contained higher standing crops than those north of Main Pass.

Ecological Studies With the Red Swamp Crawfish,
Procambarus clarki (Girard), and the White River
Crawfish, *P. blandingi acutus* (Girard)

Personnel

Cecil G. LaCaze—Graduate Assistant
R. O. Smitherman—Supervisor

Funds

Louisiana Wild Life and Fisheries Commission

Objectives

1. To determine temperature tolerances and optimum temperature for growth.
2. To determine the relationship of vertical and lateral movements with water fluctuations and population pressures.
3. To determine feeding habits and food preferences.
4. To determine limiting levels of certain chemical substances in the aquatic habitat.
5. To determine dynamics within populations of crawfish.

Progress

Monthly samples of the two crawfish species have been taken from four different habitats for stomach analysis. Freezing specimens whole in water or "glazing" seems superior to preservation in formalin or alcohol for subsequent food habits study.

Laboratory and field experiments have been completed in an attempt to determine the range of temperature within which the two species feed. Statistical analysis is not complete, but the feeding temperature range of both species is 45°F. to 95°F. Feeding activity is greatest at temperatures of 70-80°F.

In June, the brood pond for each species was drained and all crawfish counted and weighed. Production data for these ponds will be completed with processing of samples taken for stomach analysis.

Future Plans

Stomach analysis will be the primary objective during the remainder of this study. Laboratory and field feeding trials will augment stomach analysis data.

Females "in berry" will be collected from burrows during summer and autumn and transferred to aquaria for hatching and counts for brood size. Primary efforts will be devoted to *P. blandingi acutus*, since there is a paucity of information regarding the reproductive cycle of this species.

Young crawfish of both species will be placed in production experiments related to water depth and to food materials.

Incidental contributions to the biology of each species will be made through observations on burrowing habits and reproductive cycles.

Evaluation of Various Tagging Methods on
Several Freshwater Fishes and Estuarine
Fishes of Louisiana

Personnel

Walter R. Latapie, Jr.—Graduate Assistant
R. O. Smitherman—Supervisor

Funds

Louisiana Wild Life and Fisheries Commission

Objectives

1. To compare the retention rates of five tag types (Atkins, Petersen disc, spaghetti, dart, and strap) on several species of freshwater and estuarine fishes.
2. To determine the nature of the reaction of fish tissue to various tag construction materials.
3. To determine whether the mechanisms by which various tags are lost are physical or biological.
4. To determine the value of various narcotizing agents and antiseptic materials in tagging operations.
5. To compare growth and mortality rates on tagged and non-tagged fish.

Progress

Preliminary tagging experiments with 36 bluegills in aquaria have been completed. Least noticeable effects on the fish were produced by Petersen disc, Atkins, and spaghetti tags. Greatest weight loss was caused by the opercular strap tag. Some dart tags and strap tags were lost from fish after only four weeks.

Tagging experiments in plastic pools were inconclusive. A total of 90 bluegills were collected by electricity, seining, and hook and line. Most of the fish died soon after tagging, presumably from handling and high temperature of the water. Other experiments in pools were terminated prematurely by oxygen depletions brought on by heavy plankton blooms and cloudy weather.

Tissue samples were collected from tagged and non-tagged bluegills for subsequent histological determinations regarding the reaction of fish tissue to the tag objects.

Future Plans

More plastic pools will be erected and used with modified techniques to tag more bluegills, largemouth bass, and crappie. Auxiliary aeration may be required for pool experiments in the southern Louisiana environment.

A tagging operation will be initiated immediately in a 4-acre pond on the L.S.U. property which is to be drained in early 1966. Data on growth and mortality of tagged fish will be collected. Comparative tag retention in a semi-natural environment will be determined.

Fishery Investigations on Lacassine National Wildlife and Sabine National Wildlife Refuge

Personnel

Donald D. Turner—Graduate Assistant
R. O. Smitherman—Supervisor

Funds

Louisiana Wild Life and Fisheries Commission

Objectives

1. To determine species composition and relative abundance of fishes in waters of Lacassine and Sabine Refuges.
2. To determine whether physical, chemical, and biological characteristics of the aquatic environment are suitable for production of game fishes on these refuges.
3. To recommend management practices for production of fish life which will be compatible with management procedures for the production of waterfowl foods.

Progress

LACASSINE REFUGE

Sampling with electricity, rotenone, gill nets, trammel nets, and hook and line has indicated the presence of the following species of fishes:

Largemouth bass	<i>Micropterus salmoides</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill	<i>Lepomis macrochirus</i>
Spotted sunfish	<i>Lepomis punctatus</i>
Bantam sunfish	<i>Lepomis symmetricus</i>
Longear sunfish	<i>Lepomis megalotis</i>
Redear sunfish	<i>Lepomis microlophus</i>
Warmouth	<i>Chaenobryttus gulosus</i>
Flier sunfish	<i>Centrarchus macropterus</i>
Banded pygmy sunfish	<i>Elassoma zonatum</i>
Bowfin	<i>Amia calva</i>
Pirate perch	<i>Aphredoderus sayanus</i>
American eel	<i>Anguilla rostrata</i>
Redfin pickerel	<i>Esox americanus</i>
Shortnose gar	<i>Lepisosteus platostomus</i>
Spotted gar	<i>Lepisosteus oculatus</i>
Longnose gar	<i>Lepisosteus osseus</i>
Alligator gar	<i>Lepisosteus spatula</i>
Yellow bullhead	<i>Ictalurus natalis</i>
Tadpole madtom	<i>Noturus gyrinus</i>
Starhead topminnow	<i>Fundulus notti</i>
Golden topminnow	<i>Fundulus chrysotus</i>
Mosquitofish	<i>Gambusia affinis</i>
Unidentified killifish	
Unidentified darter	
Brook silverside	<i>Labidesthes sicculus</i>
Lake chubsucker	<i>Erimyzon sucetta</i>
Golden shiner	<i>Notemigonus crysoleucas</i>
Bigmouth buffalo	<i>Ictiobus cyprinellus</i>

The most numerous species of fish on Lacassine Refuge appear to be largemouth bass and warmouth. Largemouth bass apparently constitute the greatest poundage.

Predator species consist mainly of largemouth bass, alligator gar, and spotted gar. Warmouth of larger sizes may be effective as predators.

Abundant prey species include bluegill, readear sunfish, spotted sunfish, lake chubsucker, golden topminnow, mosquitofish, and golden shiner. Crawfish are relatively abundant on the refuge,

and have been found in stomachs of several largemouth bass.

SABINE REFUGE

Sampling techniques similar to those utilized on Lacassine Refuge have indicated the presence of the following species:

Largemouth bass	<i>Micropterus salmoides</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill	<i>Lepomis macrochirus</i>
Banded pygmy sunfish	<i>Elassoma zonatum</i>
Bantam sunfish	<i>Lepomis symmetricus</i>
Redear sunfish	<i>Lepomis microlophus</i>
Warmouth	<i>Chaenobryttus gulosus</i>
Bowfin	<i>Amia calva</i>
Pirate perch	<i>Aphredoderus sayanus</i>
American eel	<i>Anguilla rostrata</i>
Redfin pickerel	<i>Esox americanus</i>
Spotted gar	<i>Lepisosteus oculatus</i>
Longnose gar	<i>Lepisosteus osseus</i>
Alligator gar	<i>Lepisosteus spatula</i>
Blue catfish	<i>Ictalurus furcatus</i>
Golden topminnow	<i>Chaenobryttus gulosus</i>
Starhead topminnow	<i>Fundulus notti</i>
Mosquitofish	<i>Gambusia affinis</i>
Rainwater killifish	<i>Lucania parva</i>
Sheepshead minnow	<i>Cyprinodon variegatus</i>
Tidewater silverside	<i>Menidia beryllina</i>
Brook silverside	<i>Labidesthes sicculus</i>
Carp	<i>Cyprinus carpio</i>
Bigmouth buffalo	<i>Ictiobus cyprinellus</i>
Yellow bass	<i>Roccus mississippiensis</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Largescale menhaden	<i>Brevoortia patronus</i>
Bay anchovy	<i>Anchoa mitchilli</i>
Ladyfish	<i>Elops saurus</i>
Striped mullet	<i>Mugil cephalus</i>
Southern flounder	<i>Paralichthys lethostigma</i>
Unidentified clingfish	
Gulf pipefish	<i>Syngnathus scovelli</i>

The latter seven species were taken largely from tidewater canals interlacing the refuge. Specimens of gulf pipefish and one specimen of southern flounder were collected from an impoundment with waters of very low salinity.

Dominant species of fish on Sabine Refuge appear to be spotted gar, bowfin, and warmouth. Bowfin probably constitutes the greatest poundage.

Predator species include spotted gar, bowfin, alligator gar, and largemouth bass. Again, warmouth of larger sizes may account for considerable predation on smaller fishes.

Principal prey species include bluegill, readear sunfish, spotted sunfish, and golden topminnow. Gizzard shad and golden shiners are present in lesser numbers.

Future Plans

Sampling will be continued, with emphasis upon establishing standing crop estimates with the aid of block-off nets.

Fisheries Associated With Water Control Weirs
In the Louisiana Coastal Marsh

Personnel

Joseph G. Burleigh—Graduate Assistant
R. O. Smitherman—Supervisor

Funds

Louisiana Wild Life and Fisheries Commission

Objectives

1. To determine the fish species associated with the water control weirs.
2. To determine the development of fish concentrations after installation of such weirs.
3. To determine the factors underlying fish concentration changes at the water control structures.

Progress

Four study areas were located on tidal bayous in the Biloxi marsh near Lake Borgne. The study areas, associated with water control weirs, were each subdivided into four sampling stations. Two of the stations in each area were placed immediately landward and seaward of the weirs, one was placed 1/8 mile landward of the weir, and one was placed 1/8 mile seaward.

Samplings has been done at weekly intervals, utilizing a trammel net with 1-inch bar mesh inner wall. The trammel net is operated in a haul seine manner, and the rectangular set encompasses 4,100 square feet per station. This sampling, done to capture harvestable size sport fish, is supplemented by cast net samples for forage fishes.

A measuring stick has been placed on each weir for determination of tide stage, and direction of flow is recorded.

Determinations of oxygen, carbon dioxide, bicarbonates, total alkalinity, and salinity are made at each station. Water temperatures and turbidity readings have been collected.

Stomachs have been collected from alligator gar, longnose gar, and southern flounder for food habits and preference studies.

The following fishes have been collected from Bayou Hasouse, Bayou Grand, and Bayou Padre:

Bull shark	<i>Carcharhinus leucas</i>
Spotted gar	<i>Lepisosteus oculatus</i>
Longnose gar	<i>Lepisosteus osseus</i>
Alligator gar	<i>Lepisosteus spatula</i>
Ladyfish	<i>Elops saurus</i>
Skipjack herring	<i>Alosa chrysochloris</i>
Largescale menhaden	<i>Brevoortia patronus</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Bay anchovy	<i>Anchoa mitchilli</i>
Sea catfish	<i>Galeichthys felis</i>
Blue catfish	<i>Ictalurus furcatus</i>
Sheepshead minnow	<i>Cyprinodon variegatus</i>
Gulf killifish	<i>Fundulus grandis</i>
Mosquitofish	<i>Gambusia affinis</i>
Sailfin molly	<i>Mollienesia latipinna</i>
Gulf pipefish	<i>Syngnathus scovelli</i>
Bluegill	<i>Lepomis macrochirus</i>
Redear sunfish	<i>Lepomis microlophus</i>
Spotted sunfish	<i>Lepomis punctatus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Sand seatrout	<i>Cynoscion arenarius</i>
Spotted seatrout	<i>Cynoscion nebulosus</i>
Spot	<i>Leiostomus xanthurus</i>
Atlantic croaker	<i>Micropogon undulatus</i>
Black drum	<i>Pogonias cromis</i>
Red drum	<i>Sciaenops ocellata</i>

Sheepshead
Pinfish
Striped mullet
Tidewater silverside
Southern flounder
Hogchoker

Archosargus probatocephalus
Lagodon rhomboides
Mugil cephalus
Menidia beryllina
Paralichthys lethostigma
Trineectes maculatus

Analysis of the data is incomplete, but certain trends have been indicated. Salinity has not been greatly affected by the weirs, largely due to the fact that water can spread across the marsh at certain tidal stages. Ecological factors as yet undetermined prevent the random distribution of certain fish species in the tidal bayous. Speckled trout are quite common at three stations associated with each weir, but are seldom taken at the station farthest landward. Spot, spotted gar, and mullet are commonly taken in sampling stations seaward of the weirs. Spotted sunfish, bluegill, redear sunfish, and largemouth bass are most commonly taken landward from the weirs. The distribution of alligator gar, gizzard shad, menhaden, longnose gar, and croaker apparently is little affected by the weirs in the study area. Patterns of distribution have not been established for other species.

Future Plans

Sampling will continue into September, 1965, or until sufficient samples have been taken to determine effect of tidal stage on fish distribution. Rotenone samples will be taken to verify net sampling results.

A Study of the Age and Growth of Largemouth Bass, *Micropterus salmoides*, in False River and Old River, Pointe Coupee Parish, Louisiana

Personnel

Jerry Brashier—Graduate Student
R. J. Muncy—Supervisor

Funds

Mr. Brashier had no financial assistance, but occasionally used Unit equipment to collect data.

Progress

Mr. Brashier completed requirements for the degree of Master of Science in fisheries in May, 1965. An abstract of his thesis is presented below.

Abstract

Body measurements and scales were taken from largemouth bass during 1964 at False River and Old River. These oxbow lakes are similar in size and located 15 miles apart in Pointe Coupee Parish, Louisiana. Old River is flooded by the Mississippi River at water stages over 13.8 feet msl; however, False River water levels are not affected by flooding of the Mississippi River. Although False River is a deeper lake, water analysis data of the two lakes were similar.

The length-weight relationship was $\log W = -.85 + (3.22) (\log L)$ for False River bass and $\log W = -.77 + (3.15) (\log L)$ for Old River bass. Old River largemouth bass grew longer, heavier, and had higher condition factors (C) than False River bass in the same age group. Bass from Old River averaged 8.0 and 12.0 inches in total length at the formation of the first and second annuli, respectively; whereas False River bass averaged 6.8 and 10.7 inches total length during the same periods of growth. Old River six-year-old bass (19.0 inches) were comparable in total length with eight-year-old bass (19.3 inches) from False River. Prior one-acre rotenone samples in Old River and False River demonstrated larger poundage of fishes in Old River; however, higher percentages of small sunfish were present in False River. The faster growth of Old River bass probably results from production and concentration of bass foods during water fluctuations.

Distribution and Relative Abundance of Blue Catfish, *Ictalurus furcatus*, and Channel Catfish, *Ictalurus punctatus*, with Relation to Salinity

Personnel

Wesley G. Perry, Jr.—Graduate Assistant
R. O. Smitherman—Supervisor

Funds

Louisiana Wild Life and Fisheries Commission

Objectives

1. To determine the effect of salinity upon distribution and relative abundance of blue catfish and channel catfish.
2. To determine food habits and food preferences of the two species in a brackish water habitat.
3. To determine age composition and growth rates of these catfishes.

Progress

Sampling stations were established April, 1965, in a tidal bayou on Rockefeller Refuge, Grand Chenier, Louisiana. Stations are spaced at locations from the Gulf of Mexico to Grand Lake, a large freshwater body of water which is apparently quite productive of blue catfish and channel catfish. Each station has been sampled by means of an otter trawl at bi-weekly intervals. Rotenone has been used to verify trawling results. Other gears used have been trot lines, wire traps, and slat traps.

Pectoral spines have been removed from large numbers of blue and channel catfishes for subsequent age and growth studies. Stomachs from all fish not collected by rotenone have been preserved for food habits studies. Some 46 species, including 17 "freshwater" fishes, and 29 "salt-water" fishes, have been identified for food preference studies and for the establishment of a

checklist of fishes for Rockefeller Refuge. These fishes are listed below.

Southern Stingray	<i>Dasyatis americana</i>
Bowfin	<i>Amia calva</i>
Spotted gar	<i>Lepisosteus oenolatus</i>
Alligator gar	<i>Lepisosteus spatula</i>
Largescale menhaden	<i>Brevoortia patronus</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Threadfin shad	<i>Dorosoma petenense</i>
Gafftopsail catfish	<i>Bagre marinus</i>
Sea catfish	<i>Galeichthys felis</i>
Blue catfish	<i>Ictalurus furcatus</i>
Channel catfish	<i>Ictalurus punctatus</i>
Black bullhead	<i>Ictalurus melas</i>
American eel	<i>Anguilla rostrata</i>
Bay anchovy	<i>Anchoa mitchilli</i>
Longnose killifish	<i>Fundulus similis</i>
Sheepshead minnow	<i>Cyprinodon variegatus</i>
Sailfin molly	<i>Mollienesia latipinna</i>
Needlefish	<i>Strongylura sp.</i>
Rough silverside	<i>Membras vagrans</i>
Striped mullet	<i>Mugil cephalus</i>
Spanish mackerel	<i>Scomberomorus maculatus</i>
Atlantic cutlassfish	<i>Trichiurus lepturus</i>
Yellow jack	<i>Caranx bartholomaei</i>
Largemouth bass	<i>Micropterus salmoides</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Warmouth	<i>Chaenobryttus gulosus</i>
Bluegill	<i>Lepomis macrochirus</i>
Redear sunfish	<i>Lepomis microlophus</i>
Bantam sunfish	<i>Lepomis symmetrius</i>
Yellow bass	<i>Roccus mississippiensis</i>
Spotted seatrout	<i>Cynoscion nebulosus</i>
Freshwater drum	<i>Aplodinotus grunniens</i>
Banded drum	<i>Larimus fasciatus</i>
Silver perch	<i>Bairdiella chrysura</i>
Red drum	<i>Sciaenops ocellata</i>
Spot	<i>Leiostomus xanthurus</i>
Atlantic croaker	<i>Micropogon undulatus</i>
Black drum	<i>Pogonias cromis</i>
Sand seatrout	<i>Cynoscion arenarius</i>
Southern puffer	<i>Sphaeroides nephelus</i>
Atlantic midshipman	<i>Porichthys porosissimus</i>
Skilletfish	<i>Gobiosoma strumosus</i>
Southern flounder	<i>Paralichthys lethostigma</i>
Hogchoker	<i>Trinectes maculatus</i>
Lined sole	<i>Achirus lineatus</i>
Blackcheek tonguefish	<i>Symphurus plagiatus</i>

Future Plans

Sampling will be continued, with use of other gears designed to capture larger catfish specimens. Trawling will be reduced to 1-month intervals. Specimens will be prepared for contribution to a future listing of saltwater fishes by the Louisiana Wild Life and Fisheries Commission.

Some Effects of a Water Stabilization Structure
Upon Salinity and Fish Populations in
Grand Bayou Near Lake Calcasieu

Personnel

Paul H. Phillips—Graduate Assistant
R. O. Smitherman—Supervisor

Funds

Bureau of Sport Fisheries and Wildlife
(Research Contract to L.S.U.)

Objectives

1. To determine effects of a single water stabilization weir upon salinity levels in Grand Bayou, near Lake Calcasieu.

2. To determine the species of fishes and crustaceans utilizing the area near the weir.
3. To determine the relative abundance of fishes and crustaceans in the bayou landward and seaward of the weir.
4. To assess the effect of the weir upon the marsh as a nursery area for fishes and crustaceans having sport or commercial value.

Progress

An automatically recording tide and temperature gauge was installed on the seaward side of the weir in May, 1965. Salinity stations were located at regular intervals in North Prong of Grand Bayou. Readings for salinity are made at bi-weekly intervals.

Transects, two each on the seaward and landward sides, were run with the aid of a marsh buggy in July to determine salinity levels in the marsh from Lake Calcasieu to the Creole Canal.

Shallow water in the bayou has made the use of several conventional gears quite difficult. The otter trawl, cast net, and haul net (trammel) have been most successful.

The following species of aquatic organisms were taken in rotenone and cast net collections during June:

Striped mullet	<i>Mugil cephalus</i>
American eel	<i>Anguilla rostrata</i>
Yellow bass	<i>Roccus mississippiensis</i>
Atlantic croaker	<i>Micropogon undulatus</i>
Ladyfish	<i>Elops saurus</i>
Spot	<i>Leiostomus xanthurus</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Freshwater drum	<i>Aplodinotus grunniens</i>
Atlantic needlefish	<i>Strongylura marinus</i>
Southern flounder	<i>Paralichthys lethostigma</i>
Bay anchovy	<i>Anchoa mitchilli</i>
Spanish mackerel	<i>Scomberomorus maculatus</i>
Silver seatrout	<i>Cynoscion nothus</i>
Largescale menhaden	<i>Brevoortia patronus</i>
Sea catfish	<i>Galeichthys felis</i>
Sand seatrout	<i>Cynoscion arenarius</i>
Yellow jack	<i>Caranx bartholomaei</i>
Rough silverside	<i>Membras vagrans</i>
Mosquitofish	<i>Gambusia affinis</i>
Redear sunfish	<i>Lepomis microlophus</i>
Sailfin molly	<i>Mollienesia latipinna</i>
Atlantic threadfin	<i>Polydactylus octonemus</i>
White shrimp	<i>Penaeus setiferus</i>
Brown shrimp	<i>Penaeus aztecus</i>
Blue crab	<i>Callinectes sapidus</i>

Future Plans

Emphasis will be upon development of an improved trawl or pushnet for sampling small organisms in the shallow marsh. Regular sampling for salinity, fishes, and crustaceans will continue through winter 1965-1966.

Biology of the Bowfin, *Amia calva*, in
Southwestern Louisiana Coastal Impoundments

Personnel

Gus Stacy, III—Graduate Student
R. O. Smitherman—Supervisor

Funds

Louisiana Wild Life and Fisheries Commission

Objectives

1. To determine food habits and food preferences of the bowfin in impoundments or Lacassine and Sabine Refuges.
2. To determine growth rates and age composition of bowfin populations.
3. To determine sex ratios, and verify external means of separating the sexes.
4. To determine breeding habits and fecundity.
5. To determine habitat preference.

Progress

Forty-nine stomachs have been preserved for subsequent food habits study. Three stomachs were opened in the field. One contained two large crawfish; the second, a small crab and several grass shrimp; and the third contained a bullhead catfish. Specimens from which stomachs were taken ranged in size from 0.8 to 9.7 pounds.

Vertebrae have been collected from several sizes of bowfin. The vertebrae will be sectioned and prepared for aging studies.

Several bowfin specimens have been examined for external sexual dimorphism, and gonads preserved for corroborative histological study.

Future Plans

Collection of data will be continued during 1965-1966. Observations for breeding habits and sexual dimorphism will be done in late winter and early spring. The electric shocker will be used for collecting specimens in the future, since it has been by far the most successful method.

Effects of Semi-Impoundment on Fishes and
Crustaceans in Louisiana Tidal Marshes

Personnel

William H. Herke—Assistant Unit Leader, with field assistance from Unit students when required.

Funds

Bureau of Sport Fisheries and Wildlife

Objectives

To determine for natural tidal marsh areas and nearby semi-impounded areas:

1. Relative ingress and egress of juvenile fishes and shrimps.
2. Relative abundance of juvenile and adult fishes and shrimps.
3. Growth of fishes and shrimps.
4. Physical and water chemical data and the relationship of these to any observed differences in abundance and growth of fishes and shrimps.

Progress

The Assistant Leader chose estuarine research as a primary field of interest in June, 1964. To improve his training for this he has taken the following courses:

1. Marine vertebrate zoology and ichthyology—Gulf Coast Research Laboratory, Ocean Springs, Mississippi—6 semester hours.
2. Invertebrate zoology—L.S.U., Baton Rouge—4 semester hours.
3. Comparative animal physiology (with emphasis on fish)—L.S.U., Baton Rouge—4 semester hours.

Because of other duties, work by the Assistant Unit Leader directed specifically toward this project was slow in starting. However, the tempo is now increasing.

A limited amount of literature research has been performed.

A work boat, trailer, outboard motor and two recording thermometers have been obtained.

Some type of trap will need to be used to sample ingress and egress of juvenile fishes from the study area. A prototype trap has been designed and constructed. It was tested in March, 1965, with inconclusive results. On all succeeding trips to the study area, water levels have been too low to allow much fish movement past the weirs.

The study area is quite shallow. Therefore, a surface trawl should be the most effective method of catching small fish other than the bottom dwelling forms. Fished at night, it may be quite effective on shrimp as well. Specifications for the surface trawl used in their menhaden investigations were obtained from the Beaufort Laboratory of the Bureau of Commercial Fisheries. Unfortunately, their net requires the use of two boats. Because of this, a surface trawl to be pushed in front of a single boat has been designed and built. It is now being tested.

Several days were spent coordinating this project and Graduate Assistant Burleigh's project with Louisiana Wild Life and Fisheries Commission personnel. Thus far, most of the field work in the study area has been directed toward implementation of Mr. Burleigh's project. At the same time, this project will have many of the same sampling problems and the Assistant Leader became reasonably familiar with the project area and its problems.

About 25 days have actually been spent working in the study area. Most of this time was needed to develop a satisfactory method of quantitatively sampling catchable size fish at the weirs. The following methods were tried and rejected, for the reasons given:

1. 16-foot otter trawl and small bobinet trawl—too much debris.
2. Electric shocker—water conductivity too high.

3. Conventional trammel net sets—nets destroyed by crabs.
4. Conventional gill net sets using both multifilament and monofilament netting—nets destroyed by crabs.
5. Modified non-directional gill nets—catch rate too low.
6. Rotenone—excessive kill in moving water would have resulted in poor public relations.
7. 56-foot bag seine pulled by ropes attached to brailes—catch too low.

Two related methods were eventually found which seem to give satisfactory results. These were the use of a conventional haul seine and the use of a trammel net pulled in the manner of a haul seine. Since a new trammel net was available, Mr. Burleigh is using this. However, the Assistant Leader prefers the haul seine and intends to use one to sample larger fishes.

Future Plans

Plans for the next six months are to:

1. Intensify literature review.
2. Test the surface trawl, make any necessary modifications and begin sampling with it.
3. Begin sampling lagoon areas with a haul seine.
4. Attempt to devise methods of sampling in the intermittently flooded minor bayous and intermittently flooded emergent marsh.
5. Build a combination storage shed and small field laboratory at the Louisiana Wild Life and Fisheries Commission's Shell Beach camp.
6. Take additional course work.

Microhematocrit Values of Louisiana Fishes

Personnel

R. O. Smitherman

Funds

Bureau of Sport Fisheries and Wildlife

Objectives

1. To establish "normal" microhematocrit values for Louisiana fishes
2. To determine the effects of sexual maturity, age, condition, disease and other factors upon microhematocrit values.
3. To determine the usefulness of microhematocrit as a fish cultural tool.

Progress

With the help of several Unit graduate students, preliminary work was done February-May, 1965 toward establishing "normal" values. Fishes were taken from University ponds and drainage ditches, and generally only mature specimens were sampled. Methods were those described by Sneis-

zko (1961). An innovation was the use of a gasoline generator to power the centrifuge for packing blood samples. This allowed taking fish directly from the water and sampling blood with a minimum of handling and time lapse. The following table presents the preliminary results.

Certain fishes varied in condition, and sample sizes were inadequate, but the results will be of interest since microhematocrit values for several of the species have never been reported.

MICROHEMATOCRIT VALUES OF FISHES COLLECTED FROM BEN HUR PONDS, (L.S.U.), FEBRUARY - MAY, 1965

Species	Sex	Number of fish	Microhematocrit values		Standard deviation
			Mean	Range	
Bluegill	male	28	33.4	21.0-42.0	4.50
	female	19	33.0	20.0-43.0	6.59
Green sunfish	male	45	29.8	15.0-47.0	5.32
	female	3	31.8	25.0-36.0	5.99
Largemouth bass	male	2	31.0	31.0	0
	female	1	42.0	.....	...
Warmouth	male	1	36.5	.....	...
	female	0			
Black crappie	male	0			
	female	4	34.9	33.0-36.5	1.50
Gizzard shad	male	3	38.8	31.5-43.5	6.37
	female	2	41.5	41.0-41.5	0.5
Golden shiner	male	8	41.2	35.7-47.0	3.08
	female	14	38.2	35.0-43.0	3.56
Bowfin	male	0			
	female	2	34.0	33.0-35.0	1.40
Yellow bullhead	male	1	31.5	.....	...
	female	5	33.2	29.0-41.0	4.71

Other Activities

PESTICIDE SURVEILLANCE

The Unit Leader and Assistant Leader met in February with representatives of the Louisiana State Department of Health, Louisiana State Department of Agriculture, Louisiana Wild Life and Fisheries Commission, and Louisiana State University Agricultural Experiment Station to help set up a state-wide pesticide monitoring program. A comprehensive plan was drawn, including sampling for water, bottom sediments, fishes, and other aquatic organisms in five Louisiana streams and bayous. The monitoring program is coordinated by the L.S.U. Agricultural Experiment Station and the samples are analyzed for pesticide residue in the L.S.U. Feed and Fertilizer Laboratory.

The Unit Leader, Assistant Leader, and several Unit graduate students have collected most of the samples to date from the five aquatic habitats. Sampling was recently extended to the Angola Prison Farm lakes, where there are available records of all pesticide applications to the watershed.

Future Plans

Work will be expanded as time permits. It is hoped a student will continue this work as a graduate research project.

Reference

Sneiszko, S. F. 1961. Microhematocrit values in rainbow trout, and brook trout. *Prog. Fish-Cult* 23:114-119.

CONFERENCE ON PARASITES AND DISEASES OF FISHES

On March 16 and 17, the Unit hosted a "Conference on Parasites and Diseases of Fishes." The conference was directed by Auburn University fisheries personnel under auspices of the Cooperative Fish Parasite and Disease Project, to which the Louisiana Wild Life and Fisheries Commission contributes. Auburn staff lecturers were led by Dr. H. S. Swingle and Dr. Ray Allison. Approximately 35 Commission fishery personnel, representatives from Natchitoches National Fish Hatchery, fishery staff from University of Southwestern Louisiana, and L.S.U. fishery students and staff participated in the discussion.

LOUISIANA WILD LIFE AND FISHERIES COMMISSION TRAINING SCHOOL

Approximately 400 personnel of the Louisiana Wild Life and Fisheries Commission attended a training school held at L.S.U. in four separate two-week sessions from March-May, 1965. The Unit Leader and Assistant Leader presented lectures on pond construction and management and stream management at each of the four sessions and served on panel discussions of several fishery subjects.

Oysters, Water Bottoms and Seafoods Division

DIVISION ACTIVITIES and accomplishments have been varied and extensive during the 1964-65 biennium. Our research program has been maintained at a significant level and considerable important knowledge has been gained about the factors controlling shrimp production in Louisiana. Annual meetings with the shrimp industry have continued and the new information given the industry at this time is being extensively utilized.

Biological studies on oysters continued at the high level established during recent years. Much of the oyster information has now reached a point where it is being applied on a development and management basis, such as, the planting of shells for cultch, the rotation of oyster seed grounds for higher production and the application of hydrographic data to the prediction of oyster conditions.

Although severe hurricanes in each of the past two years significantly affected the industry, plans are now being prepared to rehabilitate some of the seed areas east of the Mississippi River through an extensive shell planting program to serve as additional cultch. In this project some 630,000 bushels of shells will be planted on selected sites.

Pond studies on shrimp were continued and efforts to aid and consult with crawfish producers have been made. More extensive research in this direction is planned.

Supervising and surveying all oyster leases, the issuance of permits for dredging and the direction of seismic and waste control surveillance have been maintained at an efficient level of operation. Oyster lease surveying is now proceeding at a more efficient rate with two survey crews now operating and plans are well advanced for the establishment of a third crew to establish permanent reference markers. Once such markers are established more accurate surveys will be obtainable and new and more accurate maps can be constructed.

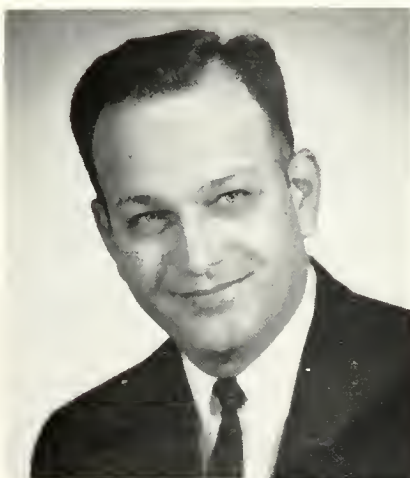
One significant advance in the commercial fish-



LYLE S. ST. AMANT
Chief

eries program has been the passage by Congress of P.L. 88-309 which provides Federal Funds for fisheries research, management and development. Division personnel made appearances before Congressional Committees in favor of the Bill and advocated its passage at the earliest possible date. As a result some \$300,000.00 of Federal funds plus \$100,000.00 of matching state funds are now available for long term marine fisheries research and management. Projects have already been submitted and approved which should nominally expand our shrimp, oyster and fisheries program to all areas of the coast.

The following report will outline some of the major activities of the Division including discussions of shrimp and oyster production, a statistical evaluation of revenue, a description of the effects of the disastrous Hurricane "Betsy" on the fishing industry, and in particular a rather detailed section on the research accomplishments during the past biennium.



TED B. FORD
Assistant Chief

SHRIMP PRODUCTION

After Louisiana's shrimp production reached an all time high of approximately eighty-three million pounds (heads on) in 1963 production reverted to more average trends in 1964 and 1965 when slightly in excess of sixty million pounds was produced each year. Though this decline in poundage appears to be significant, prices remained high and net worth of the production in the latter two years was equivalent to that of 1963.

Of possibly more long range benefit is the fact that research carried out over several successive years now seems to be pointing up those environmental factors which control shrimp production (see shrimp research section). This means that the technical section of the seafood division is becoming better able to advise the industry which allows for a more efficient harvest of its product and a greater profit. An expanded shrimp research program covering the entire coast is planned for the next biennium.

OYSTER PRODUCTION

Oyster production in 1964 was 11,401,000 pounds, and in 1965 for the eight-month period through August, 6,640,000 pounds. These figures are taken from statistical records of the Bureau of Commercial Fisheries and represent the estimated total production. The figures presented in the tables below are taken from sales records of dealers and represent those oysters on which severance taxes were collected. It is doubtful that either of the figures accurately reflect the production of oysters from Louisiana for these reasons:

1. Figures reported here represent calendar year production rather than seasonal production and are, therefore, a combination of two growing seasons. Such production figures, of course, make it difficult to determine progressive trends in production or the cyclic nature of production as a result of environmental changes from year to year.

2. It is also evident from accurate statistics kept on small areas such as Calcasieu Lake and our Sister Lake seed oyster reservation that production in all probability is considerably higher than indicated by any figures reported using a survey system of obtaining production records.

In general, oyster production in 1964 was quite good except that it would have been desirable to have a larger sized oyster more suitable for the raw shop market. Sizes of oysters, however, are to a great extent controlled by annual environmental conditions and the density of the population. It is improbable that any system can be devised to control oyster size except extending the growing period. This method, of course, is of limited value when harvesting on an annual basis is necessary. In 1965 oyster production on

a seasonal basis will be off from 40 to 60 percent because of extreme damage caused by Hurricane "Betsy" (see hurricane report). It is believed, however, that this drop in oyster production is temporary and should not be greatly reflected in next season's production.

Shell Plantings as Oyster Cultch

The planting of clam shells and reef oyster shells as cultch to serve as a substrate for oyster spat to set on has been developed to a high degree through the research efforts and field application carried out by the Marine Biological Section.

A full description of the methods used and the results obtained has been detailed in the seventh, eighth and ninth biennial reports. For the most part the development of seed areas by shell plantings has been placed on an annual basis excepting those years when it is established that sufficient natural seed was available to supply the industry.

The last shell planting involving 140,679 barrels of clam shells was completed in 1962. In subsequent years seed oyster production was considered sufficiently high so that it was not necessary to conduct shell plantings. The effects of Hurricane "Betsy," however, in 1965 indicates that shell planting will be necessary in the spring of 1966. Because of this, arrangements have already been made to purchase by contract some 630,000 bushels of shells to be planted for the purpose of aiding the production of seed oysters and restoring the seed grounds to pre-hurricane conditions.

Seed Oyster Reservations

Extensive studies of oyster production in the Sister Lake seed oyster reservation have established the fact that under natural conditions the best sustained yield for an area can be accomplished by harvesting on alternate years. It was shown that in years of optimum hydrographic and setting conditions natural reefs could produce sufficiently to be harvested annually but that in most years conditions were not suitable to attain maximum production. Therefore a sustained high yield was obtained only by harvesting on alternate years. Because of the exceptional results obtained in managing the Sister Lake seed reservation, it has now been established by the Louisiana Wild Life and Fisheries Commission that all seed oyster reservations will be harvested on the alternate year plan. In order to allow for maximum benefits to the oyster growers, Sister Lake and Bay Gardene are now harvested on alternate years, i.e. Sister Lake was harvested in 1964-65 and Bay Gardene is being harvested in the 1965-66 season. This procedure will be continued indefinitely.

Oyster production in Sister Lake continues to be successful under the alternate year harvest plan as further indicated by the harvest of 50,000 barrels of oysters during the 1964-65 season. Production data for Bay Gardene for 1965-66 was lost during Hurricane Betsy but it is believed that the production in this reservation will be satisfactory for the remainder of the season.

MENHADEN

Menhaden production in Louisiana is increasing rapidly. Recent production figures indicate more than one billion pounds of menhaden are taken annually from our coastal waters. It is evident that this industry is rapidly becoming one of our greatest fisheries and it is believed that technical services and research should be furnished the industry compatible with its value to the State.

STATISTICS

	1963	Bbls.*	1964
Shrimp Production (Heads On)			282,852.4
Fresh Water Fish			
Production (lbs.)	14,611,600		13,417,100
Salt Water Fish			
Production (lbs.)	642,991,000		609,936,500
Baby Green Turtles (No.)	1,100,000		760,000
Menhaden Production (Units)			900,206.4
(one unit—666 lbs.—approx. 1,000 fish)			

*210 lbs. per bbl.

REPORT OF COLLECTIONS (FISCAL YEAR)

	1963-64	1964-65
Oyster bedding ground rentals .\$. \$	85,028.00	88,478.00
Oyster privilege tax	15,129.04	11,145.60
Oyster tonnage licenses	2,489.00	2,012.00
Oyster dredging licenses	10,850.00	10,750.00
Oyster resale, shop, etc.	1,165.00	1,530.00
Transfer fees	28.00	49.00
Shells (oyster)	435,605.86	535,435.22
Shells (clam)	390,188.02	551,683.80
Gravel	6,200.98	13,061.23
Sand	9,622.04	8,432.85
Fill Material	85,375.02	101,190.04
Survey fee	14,615.75	12,627.25

REPORT OF PRODUCTION (Calendar year)

Total barrels of oysters taken from Louisiana waters

	1964	1965
Terrebonne	89,128.00	62,051.50
Lafourche	72,849.00	46,612.50
Plaquemines	39,766.50	52,718.00
Jefferson	79,665.00	56,342.50
St. Bernard	171,194.50	98,479.50

Total cubic yards of sand, shells, gravel and fill material taken from Louisiana waters

	1964	1965
Sand	902,197.17	158,358.28
Oyster shells	3,968,225.86	4,332,607.11
Clam shells	4,031,095.92	4,770,364.05
Gravel	32,589.90	40,614.20
Fill material	4,662,838.44	2,703,690.97

THE EFFECTS OF HURRICANE "BETSY" ON LOUISIANA'S SEAFOOD INDUSTRY

After Hurricane "Betsy" smashed through Louisiana's Coast an effort was made to assess the damage caused by the vicious storm to the States valuable seafood industry. In the initial post hurricane days little information was available but as more and more fishermen returned to investigate the damages to their camps, boats, equipment and fishing grounds, a picture of the total devastation began to take form. Needless to say the fishing industry will feel the effects of "Betsy" for several years from a production standpoint and for an even greater length of time from a financial standpoint. In some cases individual fishermen may be put permanently out of business and forced into bankruptcy because of their personal losses of boats, equipment, camps, etc.

In order to fully understand the short term and long term effects of Betsy on the seafood industry the damages must be assessed in several categories as follows:

1. Damages or loss of oyster production from the standpoint of the 1965-66 season and for future seasons.
2. Damages suffered directly by the oyster fishermen, such as the loss of or damage to camps, boats, equipment and the initial 1965 seed oyster plantings.
3. Damage or loss of shrimp production in 1965 and in subsequent seasons.
4. Damage to shrimp fishing equipment, and associated industries.
5. Damage to other fisheries such as food fish, crabs, and sport fishing.
6. Possible losses because of pollution or related causes.



The Bay Gardene Oyster Reservation Camp was battered by the winds and waters of Hurricane "Betsy" in September 1965. The steps and walkway were washed away or damaged; the generator shed was blown off at the exposed high pilings at left center; many windows were blown out; the siding was blown off the boat shed in the left background; and, other extensive damages occurred as a result of the storm.

In the following report each of the above categories will be discussed separately.

Effects on Oyster Production

To fully recognize how hurricane "Betsy" affected oyster production from the standpoint of present and future availability of oysters on the fishing ground, one should be aware of the fact that oyster culture in Louisiana is essentially a farming operation. The oyster farming procedure involves, generally the removal of seed oysters from the State managed seed ground east of the Mississippi River to private leases on both sides of the river where the seed oysters are tended, cultivated and fattened before marketing. This operation is generally on an annual basis with the season starting September 1 and harvest usually being completed by the following May. Exceptions to this system occur in that some private growers produce some of their own seed and some beds are in continuous production but on a rotational basis. Because of this some of the oysters normally planted in 1965 may not be expected to be marketed until 1967.

The path of hurricane "Betsy" across the Louisiana Coast was slightly west of the mouth of the Mississippi River and apparently nearly parallel to the river until north of Baton Rouge. This route was over the heart of the oyster growing region which for the most part extends from Vermilion Bay to the Mississippi line. The east side of the river, encompassing nearly all of the oyster seed grounds, some 450,000 acres, and about 30% or 39,880 acres private leases, was subjected to gradually rising and then extreme high tides and winds. Since the water in this area did not recede with the approach of the storm the effects of wave actions on the bottom was less severe than on the west side of the river and less silting of reefs occurred. Thus far the principal damage detected to oyster bottoms east of the river is the covering of vast areas with marsh grass and debris that was deposited on the beds by falling tides. In some areas this resulted in oyster mortalities where the debris was dense. In areas of less density, mortalities usually do not occur but the mass of material makes harvesting a problem and increases the expense of moving the product.

To the west of the river directly in the path of the hurricane was some 50,000 to 60,000 acres of leased oyster bottoms representing approximately 60% of the private leases in the State. Most of these leases had recently been planted with seed oysters initiating the 1965-66 season. In this area waters rapidly receded ahead of the advancing hurricane until most of the embayments were virtually dry which were then sub-



The Sister (Caillou) Lake Oyster Reservation Camp was hit hard by Hurricane "Hilda" in October 1964. This picture shows the crumpled radio tower, the damaged walkway, the absence of two sets of steps which were blown or washed away. Extensive erosion and other damages were also experienced.

jected to extreme winds and a rapidly moving tidal surge. This combination of factors caused many leases to be silted over, others to have all oysters and shells swept away while some were apparently totally destroyed and are not replantable. Most areas examined to date appear to be devoid of oysters and at best must be replanted.

As a direct result of "Betsy" oyster production in 1965 will be greatly reduced and delayed. Nothing can be done until the fishermen can return to work and areas can be replanted. Since large quantities of the first plantings of choice seed were destroyed the remaining seed will be scarce and of poorer quality. The net result will be a loss of production in the 1965-66 season by possibly 50%. Production in subsequent seasons should not be materially effected.

Damages Suffered by the Industry and the Individual Oyster Growers

Though the loss of possibly half of the annual oyster production will amount to a several million dollar decrease in State income and will inconvenience many consumers the damages to the physical assets of the industry and the individual oyster grower is tragic and extreme. In total this loss will far exceed the damage to the oyster crop itself and unfortunately most of the properties were either uninsurable or uninsured. A summation of such physical damage includes, three of seven canneries demolished, and a fourth badly damaged. Many boats destroyed or damaged to the extent that they will

not be operable for some time to come. Large numbers of oyster camps, associated machinery and equipment were lost, while most of the initial oyster plantings have been killed. In addition many oyster growers had their homes demolished since they live in or near the oyster growing area. The net result is a near destitute industry and some individual oyster growers faced with insurmountable uninsured losses. It is apparent that even with some part of the oyster crop still available for harvest it may not be harvested because the grower cannot overcome his personal losses. It is in this area that aid is most needed. The oyster grower by nature is a hardy individual and once he is reequipped will reestablish production in one or two seasons, but if it becomes necessary for them to absorb their loss without liberal aid or long term low interest loans, it will take years for recovery and many individuals will be forced into bankruptcy.

Effects on Shrimp Production in 1965 and Subsequent Seasons

Information on the effects of hurricanes on shrimp production is limited and those few observations available frequently show short term increases in production subsequent to hurricanes. Since shrimp or fish are mobile and can move to deep water or away from hurricane forces, momentary changes in population after hurricanes may not be a measure of loss or mortality but actually a shifting of population. Frequently excellent shrimp catches are reported to the west of storm centers, and in deeper offshore waters after the hurricane, with a subsequent decline in production as the season progresses. Following "Betsy" much the same pattern has occurred; good catches are reported to the west of offshore and near the Mississippi River Delta. Whether a decline will occur in the last three months of the season is unclear. Strong movements of juvenile shrimp into the nursery ground were occurring prior to the storm, extreme tides, winds and subsequent oxygen depletion in the water may have destroyed this part of the crop.

The most serious effect on shrimp production may be a physical one. Many of the best producing inside bays are now littered with debris from destroyed houses, camps, trees, logs, etc. This trash will greatly hamper if not totally prevent trawling in many areas.

In final analysis it is improbable that the loss in shrimp production will be serious or permanent. Production was excellent until Sept. 9 and some good catches probably will occur throughout the remainder of the season. No doubt more shrimp would have been caught without the hurricane, but it is impossible to determine the loss.

Damages to Physical Assets of the Shrimp Industry

The privately owned physical part of the shrimp industry suffered considerable damage though apparently not as much as the oyster industry. The greatest damage apparently occurred to the smaller boats which fish inside bay waters and in particular the fleets at Lafitte and in Plaquemines and St. Bernard Parishes. Large boats suffered less damage and surprisingly none of the shrimp canneries are reported to be seriously damaged.

Damage and loss of electrical power to associated industries such as docking facilities, ice and freezer plants prevented an immediate return to fishing after the storm. In some cases these problems delayed a full fishing effort for several weeks.

Hurricane Effects on Other Fisheries

The effects of the hurricane on other fisheries such as food fish, menhaden, crabs and sport fish is not clear, but it is not believed that great loss occurred. More than half of the coast was not greatly effected by "Betsy" and all of these species can move and protect themselves in the face of heavy weather. Some of all the species were killed by the rapidly moving tidal surge which entrapped them behind levees and in marsh and land areas normally dry. While dead fish from this cause were numerous in areas inundated by extreme tides, the total kill in ratio to total population was negligible. As in the case of other fisheries, damage and loss of physical equipment was considerable and represents the greater storm losses. For example two large Menhaden processing plants were badly damaged and will be closed for the remainder of the season. Floating equipment used by the Menhaden industry, however, was not damaged, but damage was incurred by the crab and food fishing fleets.

Pollution as a Result of the Hurricane

Fortunately major pollution that would be a blow for the fishing industry, did not occur as a result of the destructive storm. Immediate examinations by health officials indicated all oyster areas free of pollution. Some localized problems did occur, however. Waters trapped behind levees developed an oxygen depletion resulting in localized fish kills and broken pipelines and oil facilities resulted in some areas being polluted by oil.

Marine Biological Section

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INTRODUCTION

The Marine Biological Section has provided an increased supply of technical information and research data to the fishing industry of the State of Louisiana during the past Biennium. For the most part the great impetus in research has been brought about by the extensive and intensive shrimp research program that is gradually becoming an annual procedure. The manifold problems, in the marine environment however, necessitates that expansion and continuity of research efforts be maintained on a permanent basis to an extent that the needs of the fishing industry of Louisiana are adequately met.

The importance of marine seafood production and its attendant problems in the northern Gulf ranks first in the United States. To a large extent the key to our knowledge of northern Gulf production lies in the effects of the Mississippi River on the area. Since this valuable and all important estuarine area is the source of Louisiana's great seafood production, it should be the aim of our state to be the leader in the field of marine research and applied biology for the area. To obtain this, expansion of facilities and manpower must continue which in time will necessitate budget increases. The net result will eventually furnish protection, improvement, and an understanding of ways and means to maintain our great seafood potential.

Basically the present program of the marine biological section deals principally with the many phases of research needed to maintain our great shrimp and oyster fishery. In addition, work on marine fisheries, crabs, and sportfishing is contemplated. In general, the type of work being done may be categorized as follows:

1. Long range investigations: Aimed at bettering seafood production and quality and at alleviating various ills of the industry.

2. Short range studies and field examinations: Designed to furnish some immediate information which may be used by the Wild Life and Fisheries Commission in formulating rules, regulations, and policy concerning marine problems.
3. An extensive research program on shrimp is being developed which deals with breeding, growth, movements, and the effects of salinity and temperature.
4. An oyster research program aimed at bettering the state's production and quality of this valuable resource. Much work is planned toward controlling predators and diseases.
5. Direct technical aid to oyster growers: This is an extension type service offered the individual oyster grower. Upon official request, problems on individual oyster leases are investigated and reports prepared.
6. Development and management: Natural state seed grounds and oyster reservations are studied and managed annually to achieve maximum production. Supplemental seed oyster production is accomplished by shell plantings.
7. Cooperative research: Cooperative research is carried on with the food technology laboratory at Louisiana State University and other university and governmental research agencies interested in marine problems.
8. Education: The biological staff and the facilities of the marine laboratory are available and are frequently engaged in various cooperative educational programs with the universities, colleges, and high schools of Louisiana. Short courses, field trips and lectures are provided for interested groups upon official request.
9. Water resources and pollution: Continual availability of maximum acreages of unpolluted estuarine areas are a necessity if Louisiana's seafood industry is to survive and increase. The technical staff makes studies, prepares reports and acts in matters on interagency coordination where estuarine problems are concerned. Much work has been done on the Mississippi River-Gulf Outlet, various other navigation channels and on projects to introduce river water into our excessively saline marsh areas. Studies of industrial pollution and specific pollution problems in oyster areas require approximately 30 percent of the work schedule of the present staff.
10. Other activities: Some time is spent in preparing papers and publications to be given at various meetings. The senior biologist is also active on various inter-state and national committees, some of which are

(a) Shellfish Research Committee, Gulf States Marine Fisheries Compact, (b) Estuarine Committee, Gulf States Marine Fisheries Compact, (c) Shrimp Research Committee, Gulf States Marine Fisheries Compact, (d) Pollution Committee, Southeastern Section, American Fisheries Society.

The following report will detail typical examples of the work outlined above and will describe the location and extent of the laboratory facilities.

RESEARCH HEADQUARTERS AND LABORATORY FACILITIES

The Wild Life and Fisheries Commission's modern and extensive laboratory facilities were basically completed in August 1960 when the main laboratory building was occupied.

Since that time increased research activities and a larger staff has necessitated an expansion of the research facilities and housing as the unit becomes a permanent marine station. Some of these physical accomplishments now completed are as follows:

1. Construction of dormitory and duplex housing for the staff which releases about 25% of the main laboratory space to research area.
2. Completion of a boathouse for small boats.
3. Completion of a new 46,000 gallon fresh water storage tank.
4. Addition of outside electrical service lines.
5. Installation of a new 6-inch salt water pump to furnish water to shrimp ponds and laboratory.
6. Establishment of seven one-quarter acre ponds for shrimp pond culture experiments.
7. Construction of four 1/200 acre holding tanks for shrimp research.
8. Dredging of two deepwater wintering ponds for shrimp research.
9. Construction of bulkheading around part of the turning basin.
10. Establishment of small boatways and loading ramp.
11. Creation of a grass air strip for small planes.
12. Construction of shell roads and paths.
13. Construction of double rock navigation jetties for year-round access.
14. Construction of a new cargo-spud barge.

It is felt that Louisiana can be justly proud of its new marine research facility. The interest shown and the use made of the marine laboratory by groups outside the Wild Life and Fisheries Commission has been most gratifying and serves only to further amplify the long and great need for such a facility on the Louisiana coast. During the

short existence of the new laboratory it has functioned as a training and research area for university scientists, high school teachers, college and high school students, and a meeting place for various governmental committees and research scientists concerned with marine work.

It is evident that the Wild Life and Fisheries Commission's Marine facilities are rapidly expanding and in time will become a permanent station equal to any such establishment on the northern Gulf. Equipping the station with physical apparatus and housing requires only an adequate budget and time; on the other hand, staffing this facility with permanent well trained personnel is a major problem. At the present time the availability of trained marine scientists is extremely limited. Salaries until recently have not been competitive with other states and agencies. Even with reasonable salaries at present, staffing remains a problem because of the isolated nature of the station and a lack of graduates in marine biology in the Louisiana area. Every effort is being made to obtain a full complement of research personnel who will be satisfied to work permanently in the area.

HURRICANE "BETSY"

Hurricane "Betsy" which struck the Louisiana coast September 9, 1965 caused major damage to the Marine Laboratory facility. The main buildings remained structurally intact, but virtually everything at ground level was destroyed or carried away. The major items of damage or loss are as follows:

1. Total loss of maintenance workshop and all attendant equipment and materials.



This east view of the raised saltwater tank, laboratory building and large concrete freshwater tank (left background) shows the influence of scour and wind damage. Note the radio tower draped across the top of the roof (left to right) and the missing shingles. All permanent buildings, which have sill elevations of +15 feet msl, remained in place and generally in tact, though experiencing wind and rain damage.



Hurricane "Betsy" damage to the $\frac{1}{4}$ -acre shrimp cultivation ponds at the Marine Laboratory was extensive. Only the pilings that retained levees remain, the heavy corrugated asbestos walls being stripped or broken.



Rear view of the east side of the laboratory building showing the large scour hole and damage to the holding ponds. Although the freshwater tank does not show it clearly here, it too was scoured under and tilted approximately two feet off center. Another one located about 250 feet east of this one experienced some scouring, but did not tilt.



Scouring from "Betsy's" flood waters caused substantial damage to the steps and $\frac{1}{200}$ -acre holding ponds located on the east side of the laboratory building. Three of the four reinforced concrete block ponds were destroyed. Clearing and removing the destroyed facilities was a major undertaking in getting ready for the necessary rehabilitation program under the supervision of the La. Dept. of Public Works. The big tractor with front-end loader was indispensable.

2. Total loss of boat maintenance and net sheds along with all materials and equipment stored in them.
3. Major damage to boat shed.
4. Total loss of one 23-foot inboard boat, three 13-foot outboard hulls, and a 36-foot cargo barge.
5. Loss or irreparable damage to virtually all outboard motors and related parts and equipment.
6. Major damage to roof and interior of laboratory building.
7. Major damage to salt water system.
8. Major damage to one 46,000 gallon fresh water storage tank.
9. Major damage to "old dormitory" building used to house visiting groups.
10. Total loss to three of the four $\frac{1}{200}$ acre shrimp ponds used in feeding and growth studies.
11. Major damage to the seven one-quarter acre shrimp ponds used in cultivation studies.
12. Scouring removed large quantities of fill material from under and around the laboratory buildings and airstrip.

It is hoped that the laboratory and grounds will be restored to the previous capability in the near future. This will require repairs to and/or replacement of most of the above items. The major replacement should be a single building to replace the ones lost, namely the workshop-tractor shed, net shed and boat maintenance shed. In view of the manner by which the raised laboratory and living quarters buildings withstood the storm, this consolidated replacement building should be built on pilings also.

SHRIMP RESEARCH

Recent declines in production in the northern Gulf of Mexico have resulted in a great impetus in shrimp research by state and federal agencies. For the first time in the history of the shrimp industry enough funds have become available to support shrimp research of sufficient magnitude to supply data in quantity and quality in advance of each year's production. The importance of this fact cannot be overemphasized. Since shrimp are biologically short lived (probably not more than 1.5 years), they are capable of high rates of reproduction and rapid growth. Annual population densities in animals of this type are primarily dependent on the hatching of thousands of eggs per female and the survival of a large number of the young each year.

This supply means that the annual harvest of shrimp is dependent on the success or failure of each breeding and growing season. It is therefore evident that, if each year's harvest is to be handled in an intelligent manner based on techni-

cal facts, the necessary research and data analysis must be accomplished annually in the few months of the breeding and growing season in order that the outlook for the shrimp crop in the forthcoming season may be evaluated.

During the past five years shrimp research in the northern Gulf has been coordinated and carried out by state and federal agencies at a level which for the first time has made adequate data available in time to apply to each year's production.

These data are now being applied annually in the prediction of the shrimp harvest, the setting of seasons, and the general management of the shrimp population.

Basically, the shrimp research program carried out by the biological section is geared to gather those types of data which can be analyzed and rapidly used by the industry. Successes in postlarval sampling procedures and the determination of juvenile shrimp distribution, growth rates and densities have led to reasonably accurate predictions of each annual shrimp harvest. Outlined in the following discussion are the general procedures and results obtained from the previous years of study. It is believed that this type of research should continue on an annual basis and be refined as experience is gained. It is also evident that many other studies should be carried out and it is contemplated that new and varied projects will be added to the general research program as time and budget considerations allow.

Postlarval Studies

Most of the research on postlarval shrimp was previously discussed along with the brown shrimp work. However, a facet not discussed is the species composition. In Louisiana's coastal waters there are three commercially important shrimp: the white shrimp, *Penaeus setiferus*; the brown shrimp, *Penaeus aztecus*; and, the pink shrimp, *Penaeus duorarum*. Large pink shrimp are found in the inshore waters only in the winter months and then in very small numbers. The postlarval forms have not been identified from samples taken, if present, are assumed to be in very small quantities. White and brown shrimp postlarvae, however, are taken in large quantities and for a period of seven or more months occur together. These shrimp, averaging less than one-half inch in length, are not identifiable to species with the naked eye. They must be examined and separated microscopically.

It was not until 1963 that the characters for identification were obtained from the U. S. Fish and Wildlife Services' Marine Laboratory at Galveston, Texas. At this time a study of the species composition was begun at the Marine



Photomicrograph showing postlarval penaeid shrimp. Sampling for these forms was done regularly throughout the year as permitted by weather conditions in the three major passes controlling Barataria Bay. They range in approximate size between 3/8- and 5/8-inch when moving into the inside nursery areas. This one measured 11-12mm (0.43-0.47 inch), but has been enlarged approximately 8 times.

Laboratory. Figure 1 shows the percentage of the years catch, monthly for each species. The curves are characteristic not only of the incoming postlarval population but also of the later juvenile and adult populations. There is evidence that time of arrival, size of peaks, and densities can be directly related to the harvestable shrimp population.

These curves show several important aspects of each population. The brown shrimp curves show that when the postlarval shrimp begin moving inshore, that they come in in large numbers for only a short period of time. This group of postlarvae make up a large percentage of the year's recruitment and therefore success or failure of this group is important to the final harvestable population. The brown shrimp postlarvae, however, usually come in every month of the year and this factor insures not only a constant recruitment to the harvestable population but also the spawning population. In other words, even if heavy mortalities are experienced among the first large group of post-larvae, there should always be enough shrimp moving offshore to insure a good spawning for the next year.

White shrimp postlarvae appear to be quite different from brown postlarvae. Relative to the browns, very few whites are caught, even though the resultant white adults may be more numerous than were the browns. The only large numbers of white postlarvae taken were those caught during 24-hour sampling programs; it may be that white postlarvae move mostly at night when we do not normally sample. This postulation, however, has not yet been verified. Apparently the months of June, July and August, are the most important to white recruitment. As seen in the curves, the peak movements are more widely distributed in time than the browns. The whites also differ from the browns in that they do not occur each month, being absent in samples taken to date from November through March.



Fig. 1. COMPARISON OF POSTLARVAL CATCH, 1963 - 1965

BROWN SHRIMP STUDIES

The following paper was presented at the 18th Annual Session of the Gulf Caribbean Fisheries Institute in November of 1965. It is a summary of the research conducted on brown shrimp in Barataria Bay from 1962 thru 1965.

Studies of the Brown Shrimp, *Penaeus aztecus*, in Barataria Bay, Louisiana, 1962-1965

L. S. ST. AMANT

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ABSTRACT

Initial studies on the brown shrimp were carried out in Barataria Bay in 1962 (St. Amant,

Corkum and Broom, 1962). Information gained by this work justified a continued and expanded effort. Accordingly, postlarval investigations were broadened to include more frequent sampling of the major passes, grid sampling of the bay, and 24-hour samplings of a major pass. Juvenile studies, including distribution, relative abundance, and growth, were intensified by sampling the bay system at weekly intervals throughout the study. These data were discussed in terms of hydrographic information obtained for this area. Correlations between these shrimp studies and landings data were offered. Some implications of the shrimp's habits in this nursery area during early juvenile stages were discussed in terms of these observations.

INTRODUCTION

Shrimp research in Louisiana was begun intensively in 1962 when, as a part of the coordinated shrimp research program of the Gulf States Marine Fisheries Commission, this state initiated quantitative studies of the shrimp cycle on an annual basis. A preliminary report of this work was made in 1962 (St. Amant et. al. 1962). In this report is presented an analysis of data representing four complete brown shrimp cycles between 1962 and 1965. An effort is made, herein to compare the four cycles as to timing and ultimate production. Environmental parameters are discussed and correlated with each cycle, and those factors which appear to have more influence are identified.

In order that this discussion involve the most reliable and complete data, only findings from the Greater Barataria Bay Area, a semi-enclosed system, are considered here (Figure 1). Intensive work has been carried out in this area for the four year period and should allow for a reliable comparison of the four cycles.

MATERIALS AND METHODS

Postlarval samples on a regular basis were first taken in the summer of 1961 (George 1962). Inshore stations were made with a 6-foot beam net similar to that reported by Renfro (1960). The beam net in this study has a #2 Clark-Bumpus tail connected to a 1-millimeter mesh throat by a 5-inch steel ring. Offshore samples were made with a 0.5-meter 175 micron-mesh net similar to the "Gulf V". Each net was towed from a boat for 10 minutes at each sample station. In the spring of 1962 offshore postlarval samples were discontinued and a more concerted effort was made inshore. The three major entrances into Barataria Bay were sampled weekly as well as nine stations throughout the bay system. This was carried out through September of 1963 when the bay stations were abandoned and the three passes were sampled every weekday that weather permitted. Top and bottom salin-

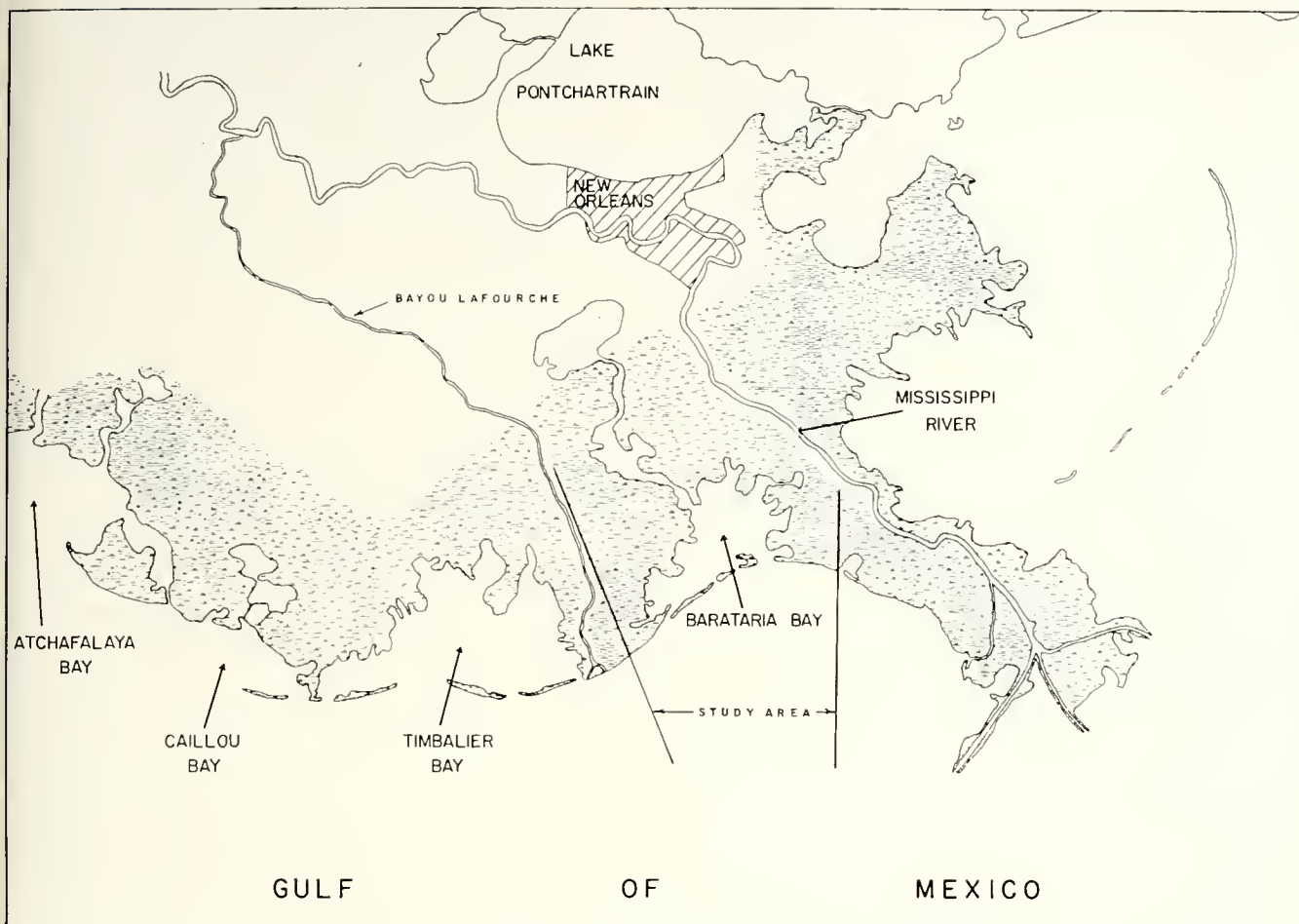


Fig. 1. VICINITY MAP SHOWING GREATER BARATARIA AREA

ities and temperatures were recorded during the sample at each of the three passes.

In the summer of 1963, a 24-hour sampling effort was begun using the 6-foot beam net at a station established in one of the deeper channels in Caminada Pass. A boat was tied to the bridge pilings and the net was fished in the tidal current for 10 minutes at 2-hour intervals.

In the summer of 1964, a grid sampling of a portion of the Greater Barataria Bay system was conducted. For each sample the 6-foot beam net was towed for 10 minutes within a 1000 yard square. All fishable waters were included in the sample area, such as, major passes, large and small bays, bayous, and marsh ponds.

Juvenile samples were made using a 6-foot, nylon, shrimp trawl with a $\frac{1}{4}$ -inch mesh. These samples of 10 minutes duration were made from both inboard and outboard boats. Juvenile, in this study, implies any shrimp caught in the 6-foot trawl and they ranged from 12 to 120 millimeters in length. Samples were made throughout the bay system, but were generally restricted to the shallow nursery areas with depths of one to five feet.

POSTLARVAL INVESTIGATIONS

Postlarval investigations were designed to determine the time of arrival, densities, and the peak movement of the postlarval population. Continuous data on salinity, water temperature, air temperature, wind direction and velocity, and tides, were taken at the level of the passes leading to the nursery areas. Correlations of these data with postlarval densities and movements were made in order to determine the factors which might control postlarval movements. Salinities and water temperatures were also taken at each station at the time of sampling.

Postlarval Recruitment, 1962-1965

The postlarval catch 120 minutes of fishing effort for the three major passes for the four cycles between 1962-1965 is shown in Figure 2. These data represent total catch and were not separated by species; however, that portion of the graph from January through May may be considered principally *P. aztecus* since *P. setiferus* is not present in numbers until June. As seen in the figure, the postlarval population peaks

occurred in April in 1962 and 1963, in February in 1964, and in March of 1965. These peak catches apparently represent the major influx of postlarvae into the bay system and should give an indication of the forthcoming shrimp crop.

It should be noted, however, that the total catch as well as the time of the peak occurrence varied considerably for the four year period. Obviously, the 1962 and 1963 catches were smaller than in 1964 and 1965. However, the greater catches in 1964 and 1965 may, in part, be a result of changes in sampling effort and technique which included an increase in effort after 1962 and a revision of the sampling time to fish the incoming tide after 1963. Though these two changes in sampling technique may have caused some increase in catch efficiency, nevertheless, it appears that the higher catches in 1964 and 1965 do represent a significant increase of postlarvae on the nursery grounds during these two years and should have resulted in a measurable increase in production. This, however, was not necessarily the case. An analysis of the data for 1962 and 1963 suggested an almost direct relationship between the postlarval catches and landings (10th Biennial Report). However, when the data for 1964 and 1965 (Figure 3) were considered, the same relationship did not exist. In this latter case, apparently heavy movement of postlarvae into the nursery area did not result in as high a production as might have been expected

had the same correlation occurred in 1964 and 1965 as existed in 1962 and 1963. This suggests that the directness of relationship between postlarval catches and landings is governed by other factors which probably increase or decrease the mortality rate of postlarvae after they arrive on the nursery grounds. While it may take an analysis of many shrimp cycles in relation to environmental parameters to establish the exact causes of postlarval mortalities, it seems evident from these data that conditions in 1962 and 1963 were far more favorable to postlarval survival than in 1964 and 1965.

Contrasting the cycle timing and environmental factors which occurred in 1962 and 1963 with those from 1964 and 1965, some significant differences may be noted. In 1962 and 1963, peak postlarval movements occurred late after water temperatures exceed 20° C. Growth was rapid and conversion of the postlarval population to juvenile occurred in four weeks or less while subjected to water temperatures greater than 20° C. and salinities greater than 15 0/00. In 1964 the postlarval peak occurred extremely early in February resulting in much longer exposure of postlarvae to temperatures below 20° C. which delays growth, to large areas when salinities were below 8 0/00 which appears to be less suitable for survival and to a longer period of possible predation. In this instance great mortalities obviously occurred and the resulting production was

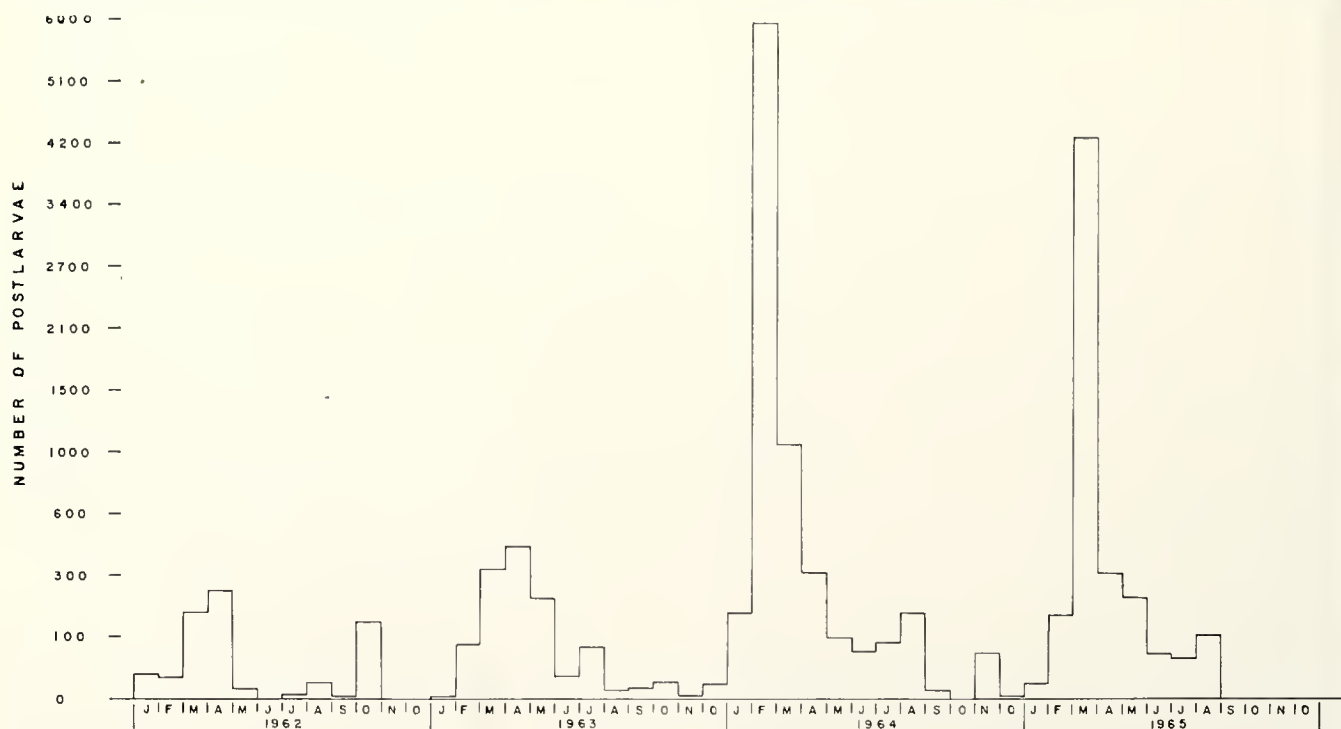


Fig.2. POSTLARVAL CATCH / 120 MINUTES OF EFFORT: FOUR BAYOUS, BARATARIA, AND CAMINADA PASSES

even less than in preceeding years when postlarval populations were low. One possible answer, was the presence of a large number of small croakers during the early spring. In 1965 large numbers of postlarvae again occurred on the nursery grounds with the peak occurring in an intermediate position in March. Postlarval growth lagged until late April and presumably high losses did occur, since production, though good, was not as great as might have been expected from the large postlarval population.

Effects of Tides on Postlarval Movements

In early postlarval sampling efforts in 1962 and 1963 a wide variation in catch results was obtained. Some observations indicated a significant tidal effect on postlarval movements which, if true, would necessitate relating all postlarval sampling to the proper tidal phase. Therefore a study was begun in the summer of 1963 to determine tidal effects on postlarval recruitment. Samples were taken at two hour intervals during the 24 hour period. The total sampling effort was 144 hours in 1963, 173 hours in 1964 and 152 hours in 1965. All data from those experiments are presented in Figure 4; an inspection of which shows that the preponderance of postlarval recruitment was on the incoming tide. No discernable difference was noted between nocturnal and diurnal sampling results during the period studied.

On the basis of a two hour sampling procedure, it appeared that a fairly sharp build up of postlarvae was associated with each incoming tide. Apparently they move in some sort of sharp-sided wave as evidenced by an abrupt appearance of large numbers of postlarvae in the samples at some point on the incoming phase of the tidal cycle. Significant numbers of postlarvae then continue to occur in samples, in some instances, throughout the remainder of the incoming leg of the tidal cycle. This high catch rate may continue for as much as 12 hours if the onset of heavy movement occurs soon after the tide changes. In some cases a lag or delay in postlarval entry into the passes may occur resulting in heavy catches late in the incoming tidal phase. While the reasons for such lags are not clear, it is obvious that on some tidal exchanges a great many more postlarvae enter the nursery grounds than on others. In all cases it appears that outward movements of tidal flows reduce or prevent the movement of postlarvae into the nursery area. This being the case, it is suggested that all postlarval sampling procedures should be closely correlated with tidal exchanges.

Grid Sampling of Postlarvae

The period of bay sampling for postlarvae (1962-1963) previously mentioned, Table 1, resulted in such variation in terms of catch that further work on this problem was suggested by



A standard 6-foot beam net with a Clark-Bumpus No. 2 tail, used to sample postlarval shrimp, is being lowered into the water from the boat's stern by one of the summer students. Several college students, who are interested in Marine Biology and whose school work is of good quality, are employed at the lab during the summer period. Here, they are exposed to all aspects attendant to its function and operation.



This is a view of the standard 6-foot beam net used in sampling postlarval shrimp as it is being fished. The beam (or board) with the associated cork and lead lines causes the net to open as it is towed. Sampling periods are of 10-minute's duration.

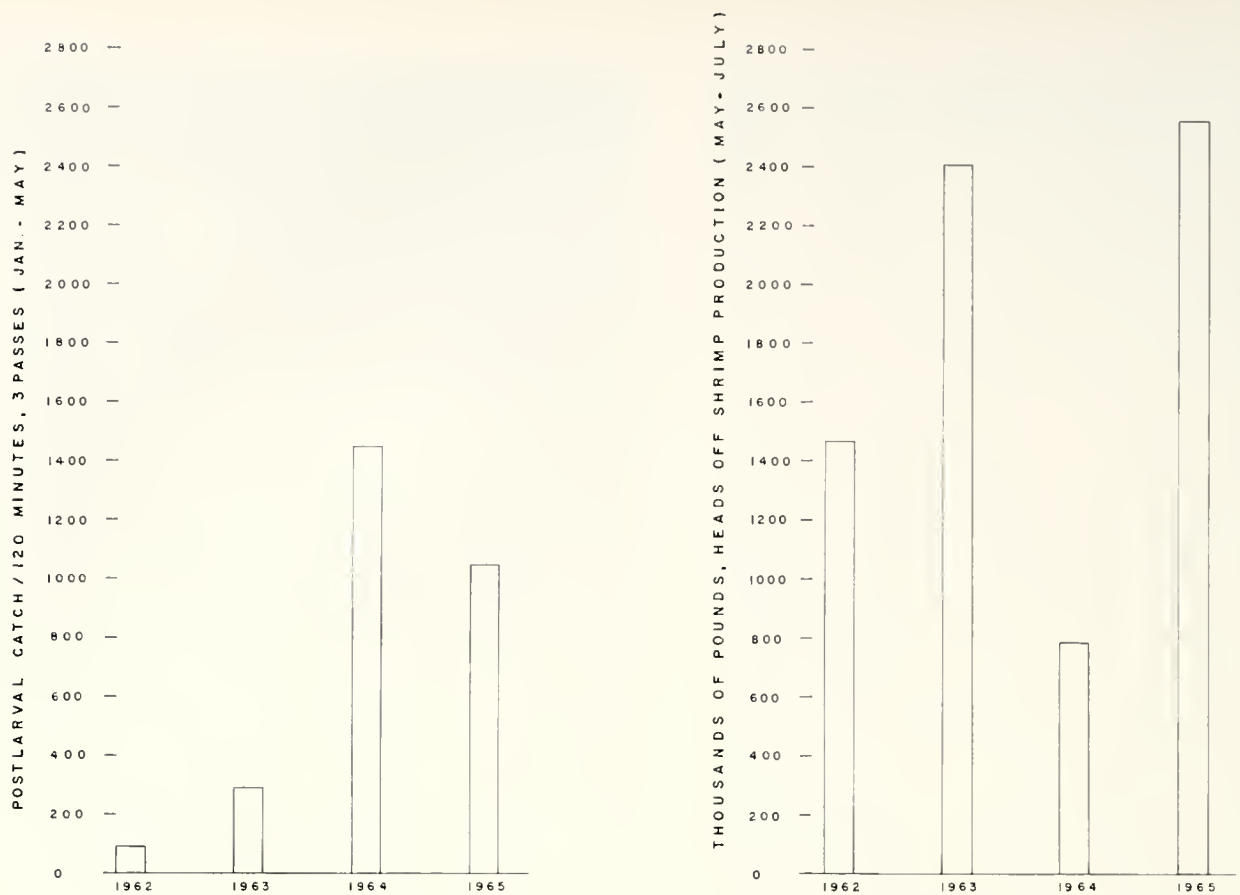


Fig. 3. COMPARISON OF POSTLARVAL DENSITY AND SHRIMP PRODUCTION: 1962-1965

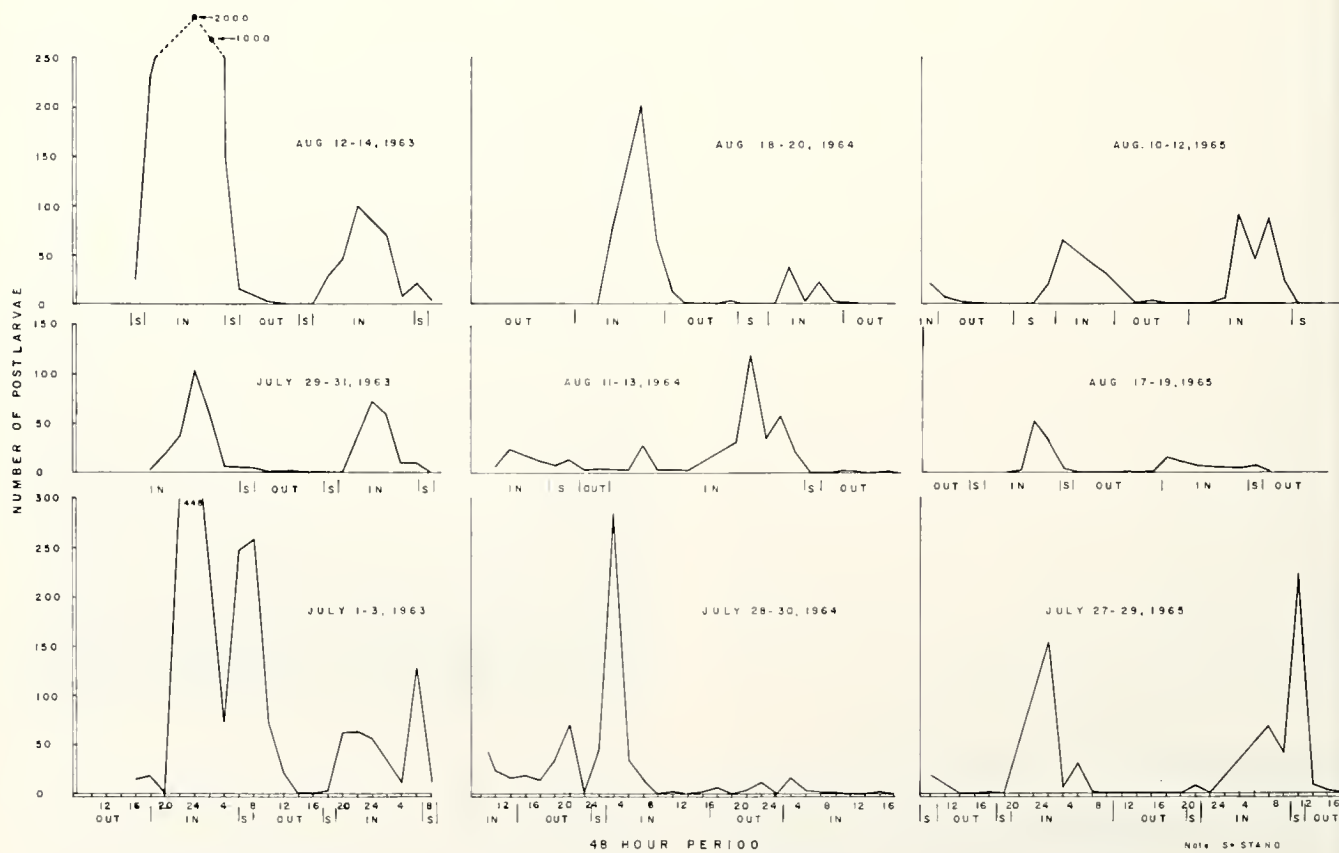


Fig. 4. COMPARISON OF TIDAL CYCLE AND POSTLARVAL CATCHES

statisticians studying the data. Accordingly, in the summer of 1964 a grid system for the Greater Barataria Bay Area was established. The grid included 184 possible sample stations, consisting of 1000 square yards each. Each 10 minute sample covered approximately 1000 linear yards within the square. Weather permitting, 15 randomly selected stations were sampled four days each week for one month. These data are summarized in Table 2.

The grid study was designed to show the total surface population of the sample area. This population for each sample day is seen in Table 2 in the right hand column. These data confirmed that postlarval shrimp may be found in substantial numbers on occasion and at other times are entirely absent from bay surface waters. However, the excessive occurrence of such variability was considerably less using the random sampling of the grid system than when using fixed bay sampling stations. This reduction in variability resulted as the random sampling procedure satisfactorily sampled any postlarval movement regardless of its location in the bay, while fixed stations were successful only when postlarvae were in the vicinity of the station. This evidence substantiates the movement of postlarvae from the major passes, through the large bays, to the shallow nursery grounds in the marshes. Heretofore, this facet of the postlarval movement was assumed but not verified in this area.

Table 1
POSTLARVAL CATCH/10 MINUTE SAMPLE
FOR NINE BAY STATIONS

<i>Year/ Month</i>	<i>Number of Stations</i>	<i>Post- larval Catch</i>	<i>Number of Postlarval/10 Minute Sample</i>
1962			
March	33	116	3.5
April	26	204	7.8
May	43	1,845	42.9
June	36	2	0.06
July	42	4	0.1
August	36	1	0.03
September	36	1	0.03
October	33	0	0
November	42	0	0
December	23	0	0
1963			
January	28	0	0
February	29	7	0.2
March	35	486	13.9
April	24	435	18.1
May	36	118	3.3
June	36	46	1.3
July	27	1	0.04
August	24	20	0.8

Table 2
GRID STUDY—A RANDOM SAMPLING OF
POSTLARVAE IN THE GREATER
BARATARIA BAY AREA

<i>Date</i>	<i>Number of Stations</i>	<i>Post- larval Catch</i>	<i>No. of PL/10 Minutes Sample</i>	<i>Projected Total PL for 184 Stations</i>
6-9-64	15	478	31.9	5,864.1
10	15	290	19.3	3,556.7
11	15	38	2.5	465.5
12	8	14	1.8	322.0
15	7	1	.1	25.8
16	15	8	.5	97.5
17	11	97	8.8	1,622.9
18	15	57	3.8	699.2
19	8	..	..	.....
22	7	..	..	.....
23	15	..	..	.....
24	No Sample	..	..	.....
25	13	8	0.6	114.1
26	8	..	..	.....
30	15	15	1.0	184.0
7-1-64	15	13	.9	160.1

JUVENILE INVESTIGATIONS

In 1962 juvenile investigations were begun in the Greater Barataria Bay Area. An intensive sampling program was carried out from March through mid-May (St. Amant et. al., 1962) The knowledge gained from the 1962 data seemed to show several important characteristics of the shrimp population. Therefore, sampling effort was greatly increased in 1963 by making more samples in this area to improve the reliability of the previous year's work. Reasonably good confirmation was indicated and the effort in 1964 and 1965 was reduced accordingly. All these data are summarized in Table 3. Included are time of initial catch, weekly average size, growth rate, number of shrimp caught each week, and catch/sample. Additionally, temperature and salinity data are given.

Landings from the Greater Barataria Bay Area are given in Table 4. These data represent the commercial catch of brown shrimp from these inside waters during the 60-day spring season and should be considered conservative since there is a sizable sport fishery for shrimp in the area for which there are no catch statistics available. It should be noted that the production figures for the Barataria Bay area should reflect the results of the principal postlarval and juvenile data analysis offered herein.

Table 3
WEEKLY *Penaeus aztecus* JUVENILE DATA FOR 1962-1965

Year	Months	Weeks	A _v . Water Temp. °C.	Cumulative A _v . Water Temp. °C.	A _v . Salinity ‰	A _v . Length in mm	Incr. in Size in mm/day	A _v . Catch/Sample	Total No. Shrimp Worked
1962	March	1	13.9	13.9	21.6	...	...	...	...
		2	15.0	14.5	23.0	...	...	...	...
		3	17.7	15.6	21.9	...	...	...	...
	April	4	19.9	16.6	19.9	31	...	9	1,225
		1	19.1	17.1	21.4	0	...	0	0
		2	22.6	18.0	19.0	...	...	*	...
	May	3	21.4	18.5	19.0	50.5	0.93	147	2,491
		4	24.0	19.2	16.6	61	1.5	98	2,341
		5	24.8	19.8	12.7	68	1.0	109	5,433
		1	25.5	20.4	16.4	73.5	0.78	217	8,871
		2	27.3	21.0	15.9	86	1.78	201	2,608
		3	28.4	21.5	16.0	91	0.71	105	1,263
	Total Av. Growth in mm/day						1.07		
1963	March	1	16.1	16.1	27.0	...	...	...	...
		2	20.1	18.1	27.4	...	...	...	2
		3	19.8	18.7	26.2	...	...	...	2
	April	4	20.4	19.1	24.4	21.5	...	10	157
		1	22.7	19.8	19.9	26.5	0.72	26	1,527
		2	21.8	20.1	23.9	36.5	1.43	87	21,569
	May	3	23.2	20.6	23.2	43.0	0.93	145	2,761
		4	26.1	21.3	19.9	60.0	2.46	106	3,396
		5	23.8	21.5	20.1	72.5	1.78	150	3,582
		1	24.2	21.7	25.9	77.0	0.64	192	7,666
		2	25.7	22.0	28.2	78.0	0	244	3,175
		3	26.5	22.4	23.4	77.0	0.99	113	1,584
	Total Av. Growth in mm/day								
1964	March	1	16.7	16.7	27.7	...	...	...	...
		2	18.5	17.6	23.9	15.0	...	2	8
		3	17.9	17.7	23.6	18.0	0.43	2	52
	April	4	17.6	17.7	22.2	22.5	0.57	2	106
		1	17.2	17.6	19.2	22.5	0	5	280
		2	19.9	18.0	17.0	31.0	1.28	23	298
	May	3	20.8	18.4	13.9	37.5	0.86	31	959
		4	24.2	19.1	14.9	43.5	0.86	24	806
		5	25.0	19.8	13.2	56.5	1.85	44	1,710
		1	23.6	20.1	16.7	72.0	2.30	45	1,658
		2	25.7	20.6	15.2	82.0	1.43	45	5,386
		3	26.4	21.1	13.9	84.0	0.29	42	858
	Total Av. Growth in mm/day						0.99		
1965	March	1	14.1	14.1	17.5	31.0	...	5	136
		2	15.4	14.8	25.7	34.0	0.43	8	488
		3	17.5	15.7	25.9	32.5	0	8	81
	April	4	16.3	15.8	22.5	33.5	...	3	81
		1	20.8	16.8	22.0	33.0	0	8	459
		2	24.9	18.2	15.5	31.0	0	22	1,301
	May	3	25.0	19.1	15.0	36.5	0.79	68	2,030
		4	24.6	19.8	18.1	40.5	0.57	87	3,046
		5	24.4	20.3	15.8	57.0	2.50	307	5,840
		1	24.6	20.8	17.5	59.5	0.36	152	1,751
		2	25.9	21.1	13.5	...	*	...	...
		3	25.2	21.4	13.4	73.5	1.00	353	2,830
	Total Av. Growth in mm/day						0.55		

* No Sample

First Occurrence

The first occurrence of juveniles in trawls samples has varied from year to year. In 1962 and 1963 they were first found in the fourth week in March. Then, in 1964 they first appeared in the second week in March, while in 1965 they apparently occurred during the first week of March. The latter case was not clear-cut because a mild, extensive winter was experienced and there was a considerable overwintering population. The first appearance of these very small juveniles, 12 to 40 millimeters in length, always occurred in a specific, shallow marsh area where salinities are high for this area ranging from 20 to 30 ppm. The bottom in this specific locality is characterized by having an abundance of material locally referred to as "coffee grounds". This material, a plant detritus closely associated with the bottom, is commonly found in shallow areas throughout the bay system. After this initial appearance, juveniles were generally found in other shallow marsh areas throughout the system.

Movement

The normal shrimp cycle is now well established and involves the movement of postlarvae into inland waters, thence deep into the shallow nursery areas where they metamorphose into rapidly growing juveniles. These juveniles, as they increase in size, begin a movement into the deeper, larger bays, through the lower bays and out the passes to offshore waters. Though the cycle is constant, the timing of this cycle from year to year may vary considerably as indicated by the early or late arrival of postlarvae, the first appearance of juveniles and the relative sizes of shrimp as they move offshore. Our studies indicate that several factors may influence the timing of the shrimp cycle with respect to offshore movement; among these, crowding appears to be one of the most significant. For example, the average-sized shrimp on inside fishing grounds in the third week of May in 1962 and 1964 was larger than those in 1963 and 1965. The latter were years of high population density, while those of 1962 and 1964 were appreciably lower. Such data indicate that crowding may be an important factor contributing to an earlier offshore movement of smaller shrimp, though at this time it is not known which crowding factor is causing the movement. Future studies should indicate whether competition is for food, space, cover or whether the movements are a result of some more obscure cause or combination of causes. Another factor which may influence movement is temperature. Weekly observations from pond studies indicated that growth was reduced when temperatures reached the 29° to 33°C. range. This may indicate that brown shrimp move offshore seeking a more optimum temperature than would be found in

the shallower bays as summer weather causes shallow water temperatures to soar.

Growth Rate

Studies of juvenile growth and densities in the Barataria Bay area indicate an important relationship between happenings at this stage of the cycle and eventual production (St. Amant et. al., 1962). Because of this, intensive investigations of growth rates and densities and their relationship to hydrographic conditions were carried on from 1962-1965. Reported here is a summary of the findings for the four year period. Growth rates are summarized as the average growth/day for each week during the month of March, April and May for each year (Table 3). It is apparent from these data that growth varies from week to week and in corresponding weeks from year to year. The range of variation was from no growth to 2.5 mm/day during the four year period. It is significant, however, that though growth varies considerably the average growth rate from the initiation of growth through the third week in May is relatively constant. For example, in 1962, 63 and 64 growth averaged approximately 1.0 mm/day. In 1965 average growth was slower from the first appearance of juveniles to mid-May, but it should be noted that no significant growth occurred until mid-April. An average growth rate of 1.06 mm/day was attained after this date. An examination of Figure 5 showing growth curves for the four year period indicates that there is a trend for late appearing or slow growing early juveniles to increase their rate of growth in the latter part of the cycle. This results in a relatively constant average growth rate from year to year.

In examining the environmental parameters in relation to growth, temperatures seem to be the most significant. There appeared to be a trend,



During the past four years, literally thousands upon thousands of shrimp (postlarvae, juveniles and subadults) were examined as a part of the shrimp research program). Here, a biologist records the species, sex, length and number of shrimp in this sample taken from Barataria Bay.

though not completely evident in these data, for the growth of brown shrimp to be less than 1.0 mm/day when the water temperature was below 20°C. and less than 1.5 mm/day when the water temperature was below 25°C. Little or no measurable growth was noted at cumulative average water temperatures below 16.0°C.

Density

An analysis of density data of juveniles appears to show the best correlation with future production. Catch/sample data in Table 3 and Figure 5 compares well with total production (See Table 4 and Figure 3). It seems evident that the density of juvenile brown shrimp on the nursery area was indicative of the final production for the years 1963, 64 and 65. In 1962, catch/samples were relatively high while landings were low, this is apparently the result of a known bias in sampling. The shrimp that year were concentrated on the western side of the Greater Barataria Bay system and almost no shrimp were on the eastern side. Samples were made much more frequently on the western side in an effort to increase the reliability of the growth rate. In the following years samples were made of near equal intensity in all areas.

The catch/sample of juveniles (Figure 5) appeared to be a better indication of the forthcoming shrimp landings than the postlarval catch (See Figure 3). As previously mentioned, the 1964 postlarval catch was very high but peaked earlier than usual. This indicated the possibility of a large, early shrimp population. Subsequently, a low catch/sample rate was obtained during juvenile sampling and the brown shrimp landings for Barataria Bay for 1964 proved to be low (Table 4). There is little doubt that a considerable mortality occurred between the time of first entrance into the bay system and the time of initial fast growth. The reason for this failure, at present, is not clear, but it should be noted that in 1962 postlarvae entered the bays extremely early and were subjected to low temperatures and salinities for a considerable period of time. This longer exposure to adverse environmental conditions and possible predation may in part account for the loss.

Table 4

MONTHLY TOTAL BROWN SHRIMP LANDINGS IN POUNDS, HEADS-OFF BARATARIA AND CAMINADA BAYS

	1962	1963	1964	1965
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	637,354	1,451,086	419,945	947,625
June	563,642	748,705	198,820	1,065,381
July	253,001	207,600	154,096	547,169
lbs. heads-off ...	1,453,997	2,407,391	772,861	2,560,175

HYDROGRAPHIC CONSIDERATIONS

Since variations in the timing of the annual shrimp cycle and resultant production seem to be closely associated with several hydrographic factors, as much of these data have been collected, as possible, in an effort to correlate environmental parameters and shrimp production. Continuous recordings of salinity and temperature data were taken at the Marine Laboratory. These are summarized in Table 3 and represent average conditions in the southern half of Barataria Bay. Data for the north half of the Bay are based on weekly sampling efforts.

Water temperature variations in the bay area follow a cycle closely associated with air temperature as would be expected for such shallow inshore waters. Some slight difference may be noted between North and South Bay waters in that the latter are slightly higher in summer and colder in winter (Figure 6). This is believed to be a result of shallower waters in the upper bay. Though daily and weekly temperature variations are apparent in all measurements, the cycle in any given year between January and May is represented by a gradual rising trend (See Table 3 average and cumulative water temperatures). Most significant appears to be the variation in the timing of the temperature cycles from year to year. For example, in 1963 water temperatures exceeded 18°C. as early as the second week in March while in other years this cumulative average water temperature was not attained until the second week in April.

Typical salinity profiles of the Barataria Bay System are shown in Figure 7. As would be expected under most conditions higher salinities prevail in the lower (South) bay near the Gulf and follow a decreasing gradient to the upper bay area. The slope of the gradient varies considerably and may become complex because South Bay salinities are strongly effected by Mississippi River flows while North Bay conditions are further effected by rainfall and local drainage. For example, South Bay salinities in 1963, 64 and 65, were relatively high but showed a lowering trend in April and May as river stages increased while North Bay conditions showed different variations with high salinities in 1963, low in 1964 and average conditions in 1965 (See Table 5). It is now apparent that variations of rainfall and river stages from January through May subject postlarval and juvenile shrimp to significant changes in salinity from year to year. More significantly, these variations dictate whether substantial acreages of the nursery area will be suitable or unsuitable for the greater portion of the shrimp population.

DISCUSSION AND CONCLUSIONS

After four years' investigations of the brown shrimp cycle, it is becoming more and more ap-

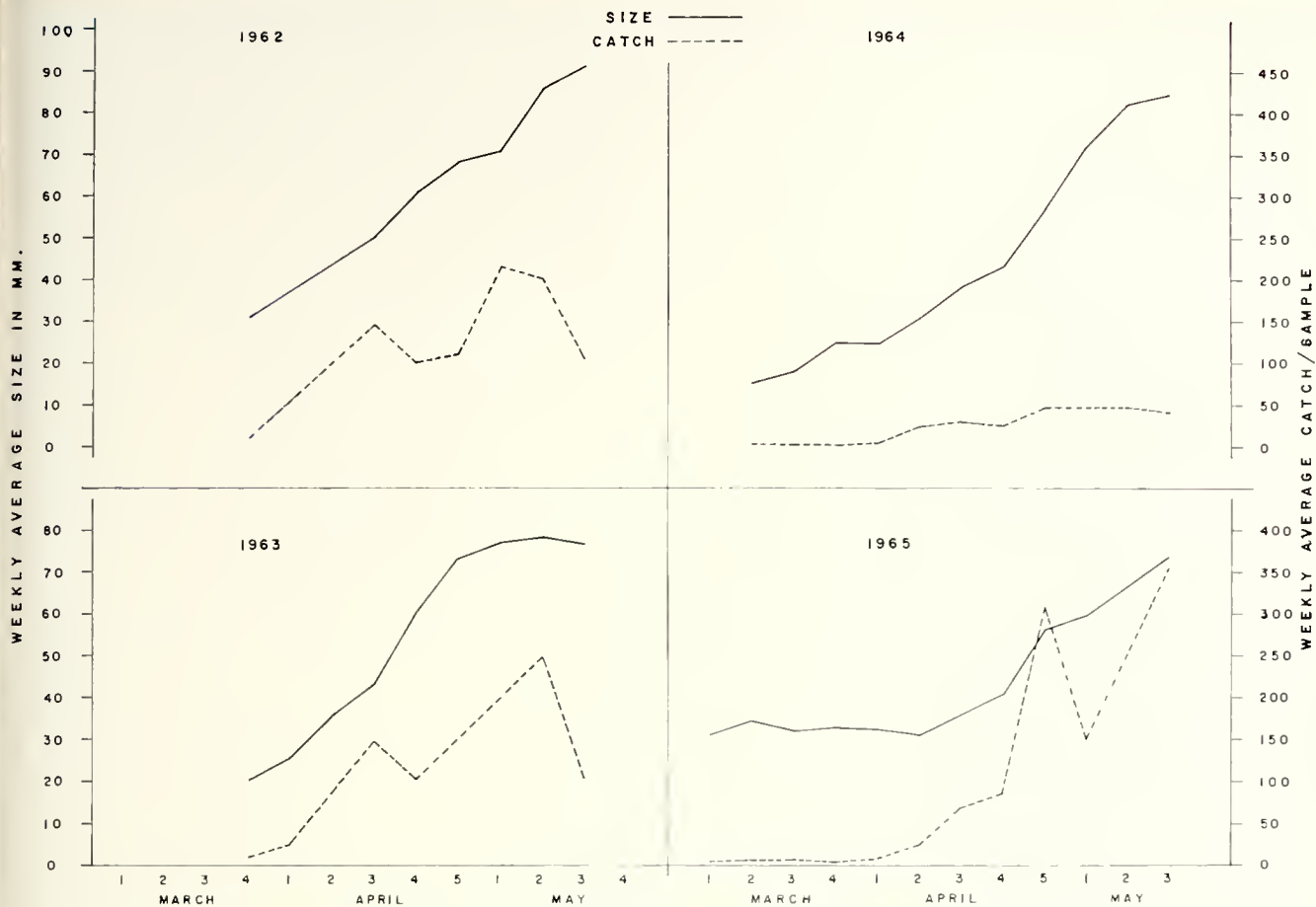


Fig. 5. COMPARISON OF BROWN SHRIMP SIZE AND CATCH

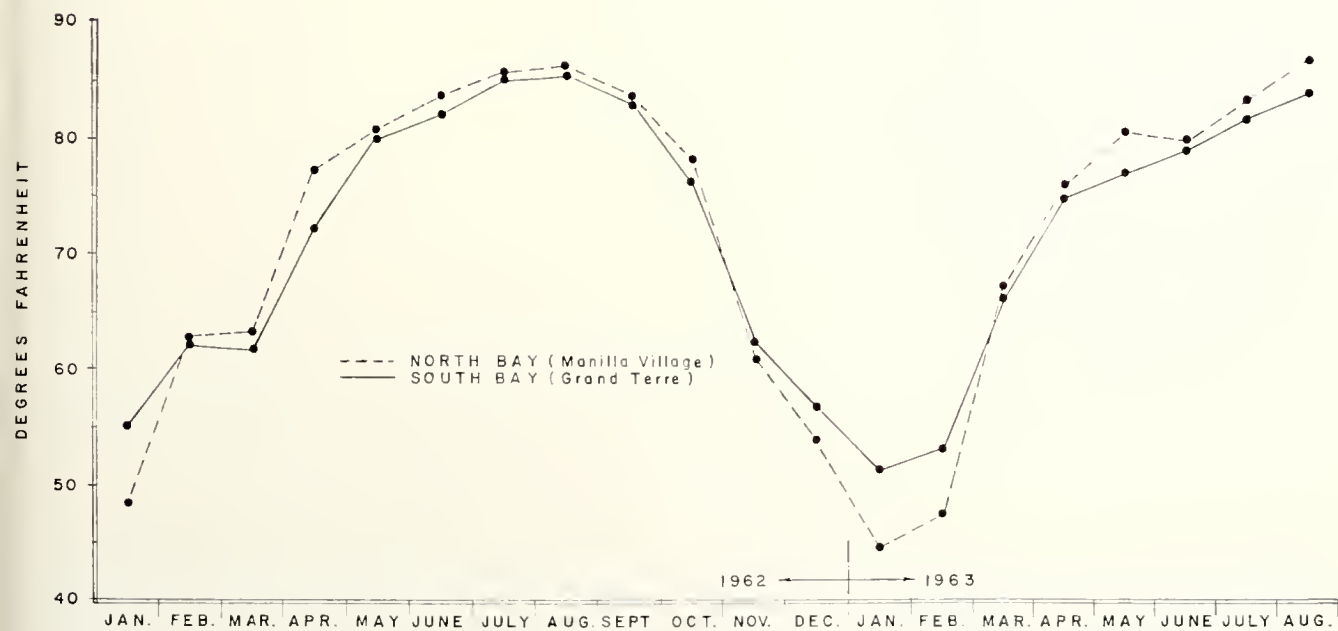


Fig. 6. COMPARISON OF BARATARIA BAY SURFACE WATER TEMPERATURES

parent that environmental parameters, as they effect the timing of the shrimp cycle, to a large extent control final production. While we have no information to explain the success of offshore breeding or the relative abundance and time of arrival of the postlarvae at the passes, it is probable that this part of the shrimp cycle is also effected by environment. Once the postlarvae enter the passes, however, it becomes more apparent with each year's investigations that survival and efficient production from the available crop of postlarvae is associated with the environmental parameters they meet in the nursery area.

Table 5
NORTH AND SOUTH BARATARIA BAY
MONTHLY AVERAGE SALINITIES 0/00

	1962	1963	1964	1965
SOUTH BAY				
January	21.1	29.4	24.9	23.2
February	20.4	28.7	24.6	24.5
March	21.2	26.6	23.3	22.5
April	18.7	21.6	15.5	16.5
May	15.5	25.3	14.6	14.7
June	17.3	24.6	16.3	14.0
NORTH BAY				
January	3.4	17.1	8.6	12.1
February	9.4	11.1	7.2	9.8
March	12.3	18.4	4.5	11.2
April	10.5	21.8	5.7	13.2
May	12.9	19.8	7.9	14.8
June	13.1	17.3	10.7	15.7

An examination of Figure 3 indicates that the amount of postlarvae entering the Barataria Bay System varied considerably during the four year period. It is also evident that final production is

not necessarily in direct proportion to postlarval density. It is now clear that efficient survival and growth of a relatively few postlarvae in 1963 produced as large a catch as a dense postlarval population in 1965. Even more significant is the failure of the extremely high postlarval population in 1964 to produce as well as 1963 or 1965 (Figure 3 and Table 4).

Determining the exact nature of environmental control of the shrimp cycle and resultant production may require years of investigation; nevertheless, annual variations in temperature and salinity can be correlated to a degree with postlarval and juvenile survival, growth, and distribution on the nursery area. It now appears more optimum if postlarvae arrive on the nursery area after late March when they are more likely to encounter waters warmer than 18°C. and preferably above 20°C. Survival and growth also appears to be further enhanced if salinities are in excess of 10 0/00 and preferably higher. Most efficient survival and growth of postlarvae occurred in 1963 when the population peak occurred in late April and when all postlarvae entering after the second week in March encountered water above 18°C., and salinities greater than 17 0/00 over most of the nursery areas. By contrast the peak of an unusually dense postlarval population in 1964 occurred in late February and resulted in serious mortalities and poor production. In this case postlarvae were subject to temperatures below 18°C. for a period of seven weeks and were faced with large areas of nursery ground where salinities were less than 8 0/00 (See Tables 3 and 5). Whether the high mortality of postlarvae in

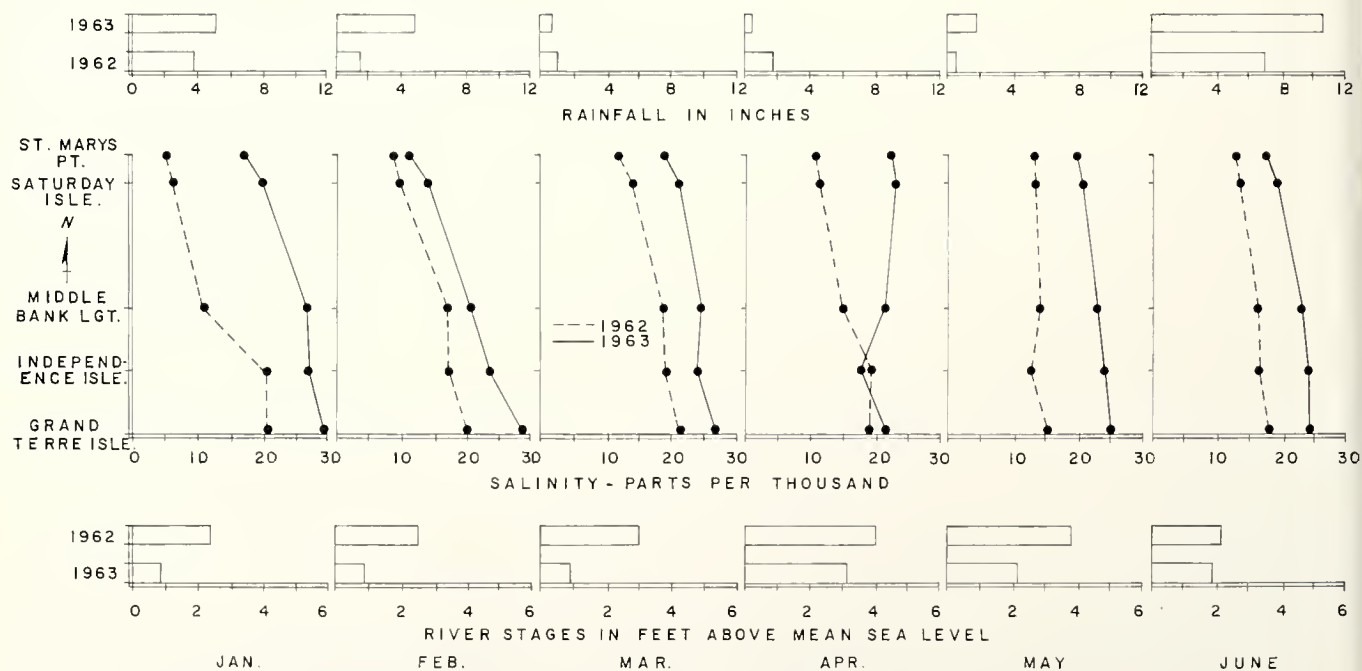


Fig. 7. BARATARIA BAY SALINITY PROFILES

1964 was a result of long exposure to low temperature, or combined low temperature and low salinity, or excessive predation during a period of little growth is not known. Production in 1965 appears to confirm the analysis of conditions as presented for 1963 and 1964. In this case large numbers of postlarvae arrived on the nursery area and eventually produced slightly more poundage than in 1963 (Table 4). Nevertheless, it is clear that less efficient survival of postlarvae and juveniles occurred in 1965 than in 1963 and this low survival appears to be associated with early postlarval arrival (early March), long exposure to cold water, and intermediate salinity ranges.

In final analysis, it is apparent that shrimp cycles will vary in timing and efficiency from year to year and in certain instances from one nursery area to another in the same year. Such variation will necessitate that research programs be geared to routine annual investigations involving quantitative studies of the shrimp cycle and controlling environmental parameters if accurate predictions and production and information is to be furnished the industry.

Other important results and trends as indicated by the data presented above are as follows:

1. The appearance of postlarval population peaks may vary considerably occurring from late February to early May.
2. The appearance of postlarvae at the passes seems to have little relationship to water temperature on the nursery ground, but survival and growth of the postlarvae is apparently strongly effected by temperature and possibly salinity.
3. Heaviest postlarval movements are associated with incoming tides.
4. Best growth and survival occurred when late arriving postlarvae encountered water temperatures above 20°C. and salinities above 15 ‰.
5. Growth rates of juveniles vary from week to week, but average growth for the major growing period is approximately 1.0 mm/day.
6. Density and distribution of juveniles offers sounder information upon which to predict future production, while a direct relationship exists between postlarval density and future production. The efficiency of survival is apparently dependent on varying environmental parameters.

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WHITE SHRIMP STUDIES

White shrimp sampling in general has been carried out on a less intensive though more prolonged scale than the sampling for brown shrimp. The reason for this being that the satisfactory techniques developed in studying the brown shrimp have thus far been much less successful on the white shrimp. Satisfactory sampling techniques for studying the white shrimp in Louisiana just have not yet been developed due to differences between these two species. Thus, this sampling effort has been less intensive than for brown shrimp, although work on the improvement of techniques is continuing. Table 1. shows the total catch of brown and white shrimp in Barataria Bay during the present biennium.

One of the main differences in the two shrimps is the apparent schooling habit of the white shrimp. Unlike browns, white shrimp are usually found in relatively large numbers or not at all. On years of low abundance, hours of fruitless sampling will be spent indicating no shrimp at all, when an unexpected large concentration will be found in some isolated area. During years of high abundance, apparently the pattern is nearly the same, except the concentrations are found much more frequently. Nevertheless, the present sampling techniques cause a lack of confidence, being more of a hit or miss proposition. Figure 1 shows the catch per sample for the duration of sampling in 1964 and 1965. It may be seen in the curves that the catch varies radically and does not progress in an upward trend as does the catch of brown shrimp. This habit of concentration also



Fig.1. POPULATION DENSITY OF WHITE SHRIMP IN THE BARATARIA BAY SYSTEM, 1964 and 1965

affects the projection of growth curves (Figure 2). An analysis of these growth curves would indicate that white shrimp grow very little or even, at times, decrease in size. This assumption would be entirely wrong since pond studies have shown the growth of white shrimp to be quite rapid during this same time period.



The 6-foot juvenile shrimp trawl, similar to the "try net" used by commercial shrimp fishermen except the mesh size is smaller, is being lowered into the water from a shallow-draft outboard hull. In this scientific shrimp research and management program, various types of sampling gear are used—some of the gear would be illegal if used by any unauthorized persons. Sampling "the nursery" grounds requires much shallow water navigation in order to get to the juvenile shrimp.

Another assumed difference between brown and white shrimp is the ability of the white shrimp under certain conditions to escape the sampling trawls. Large white shrimp, over 4 inches in length, in most instances are not caught in the 6-foot $\frac{1}{4}$ -inch mesh trawls. Also, the very small whites, less than 1.5-inches in length, are not caught in large numbers as are the small browns.

Table 1.

**SHRIMP CATCH, BARATARIA BAY
JANUARY, 1964 THROUGH OCTOBER 1965**

	<i>Brown</i>		<i>White</i>	
	1964	1965	1964	1965
January .....	....	66	....	13
February .....	....	35	....	4
March	446	714	6	26
April	3,773	12,217	6	69
May	8,618	4,779	22	..
June	766	1,211	223	12
July	285	462	3,268	185
August	87	947	1,441	654
September .....	....	220	....	23
October .....	....	27	....	190
November .....	....	....	....	..
December .....	....	....	....	..

These differences in the two shrimp species set the stage for the future work on white shrimp at the Marine Laboratory. Some of the work planned to study these problems is as follows:

1. To use trawls of different size, type, and

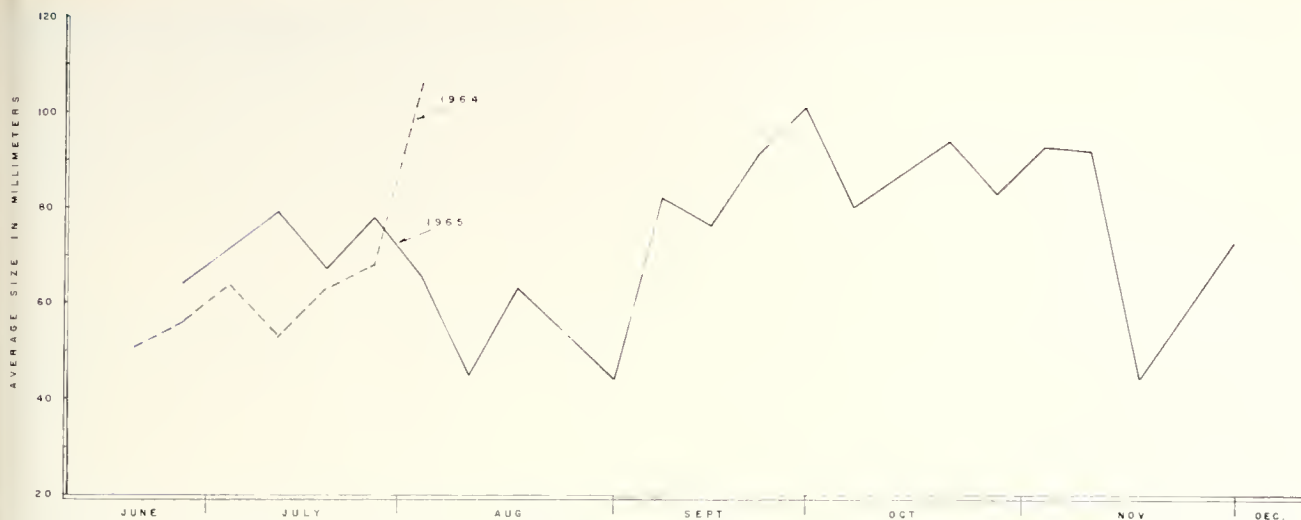


Fig. 2. GROWTH OF WHITE SHRIMP IN THE BARATARIA BAY SYSTEM, 1964 and 1965

mesh size to evaluate as well as improve the catch.

2. To conduct an intensive search, both in scope and habitat type, for the very small white shrimp.
3. To conduct pond studies using white shrimp to better understand the habits of movement, concentration, and catchability.

Flight Sample Study

In June 1963 a study was begun using a floatplane to sample postlarval shrimp. Weekly samples were made along the coast of Lafourche and Terrebonne parishes using a $\frac{1}{2}$ -meter plankton net. This net was used because the size of the airplane prohibited the use of the larger beam net normally used at the Marine Laboratory. Several important facts concerning postlarvae have been determined from this study. It was demonstrated (Table 1) that postlarval shrimp are recruited to the inshore waters of this area mostly on the incoming tide. This principle, though established in other areas, had not been previously known in this area.

The postlarval catch for each year studied was directly related to the shrimp landings. In Table 2, the shrimp landings and corresponding postlarval catch per 120 minutes of sampling effort show this relationship.

Juvenile samples have also been made to a limited extent with a floatplane. In the summer of 1965 during the preseason survey of white shrimp, samples were made covering the entire Mississippi River delta below Empire, Louisiana. This survey was made in three days by two biologists in a floatplane. It is estimated that four boats and their associated personnel and equipment would have been required to do the same job in the same time period.

Table 1.

COMPARISON OF FLOATPLANE POSTLARVAL CATCH Incoming and Outgoing Tides

	<i>Number of Samples</i>	<i>Catch of Postlarvae</i>	<i>Catch/120 Min. of Sampling</i>
<i>1963</i>			
Total	35	168	58.0
Incoming Tide	23	153	79.7
Outgoing Tide	12	15	15.0
<i>1964</i>			
Total	36	146	48.7
Incoming Tide	25	145	69.0
Outgoing Tide	11	1	1.1
<i>1965</i>			
Total	48	114	28.5
Incoming Tide	27	111	49.3
Outgoing Tide	21	3	1.7

Table 2.

COMPARISON OF FLOATPLANE POSTLARVAL CATCH WITH SHRIMP LANDINGS

	<i>Shrimp Landings (in Millions of lbs.) Houma area</i>	<i>Postlarval Catch/120 Minutes of sampling</i>
<i>1963</i>		
White	10.3	
Brown	3.6	
Total	13.9	79.7
<i>1964</i>		
White	7.4	
Brown	2.3	
Total	9.7	69.0
<i>1965 (Thru November)</i>		
White	4.9	
Brown	3.6	
Total	8.5	49.3

Sister (Caillou) Lake Shrimp Study

Shrimp sampling on an intensified scale was begun at the Marine Laboratory in the spring of 1962. The study has consisted of a large number of juvenile and postlarval shrimp samples being taken in the Barataria Bay System, the samples being analyzed, and the data being used to project vital parameters of the shrimp population. The other shrimp production areas of coastal Louisiana were sampled only once each year before each shrimp season because of a lack of equipment, materials and manpower. An attempt was then made to correlate the data from the Barataria Bay area in which there was a high degree of confidence with those data from the rest of the coast. In most instances this procedure was successful; but, statistically speaking, one sample has little value and there was little confidence in such a correlation.

Therefore, in the spring of 1965 a biologist was sent to the Wild Life and Fisheries Commission's Camp at Sister Lake to sample the area from Four League Bay to the Houma Navigation Canal. Generally, the same procedures used as at the Marine Laboratory were followed: (1) postlarval samples were made with the beam plankton net; (2) juvenile samples with a $\frac{1}{4}$ -inch mesh 6-foot trawl; and (3) temperatures and salinities of the area were taken. The growth rates of brown shrimp in the Sister Lake and Barataria Bay areas are compared in Figure 1. The growth rates appear to be very nearly the same and the size of shrimp should have been only slightly smaller at Sister Lake on the opening day of the trawling season, May 15. The catch per sample is relative to the density of shrimp present and, as seen in Figure 2, the density of brown shrimp in Sister Lake was almost that of Barataria Bay. White shrimp were also sampled, but on a less intense scale. Figure 1 and 2 also represent the growth and density of white shrimp in the Sister Lake area. The growth curves demonstrate the high rate of growth of nearly one inch per month. The density curves were as expected, that is, a decrease in population in the spring and high variability in late summer. An isohaline map was made of the area (Figure 3.) showing the average salinity over the period of study. Several conclusions may be drawn from the work in the Sister Lake Area:

1. Brown shrimp are scattered uniformly throughout the areas where they are found at all.
2. White shrimp are much more concentrated and may be present one day and absent the next from any given location.
3. Temperature is a key factor in controlling growth.
4. Salinity is a key factor in delimiting acceptable or suitable range.

5. The optimum salinity range for the brown shrimp seems to be 12 to 18 parts per thousand, but they are found in waters of 3 to 25 parts per thousand.
6. Large white shrimp, 4 to 6 inches in length, may be present in fairly large numbers in late March and early April, but have usually moved offshore by May.

POND STUDIES

Pond studies were first begun at the Marine Laboratory in 1962, as previously reported in the 10th Biennial Report. These experiments utilized a $\frac{1}{4}$ -acre dirt bottom pond built on a tidal flat near the Marine Laboratory. This pond was stocked with postlarval and juvenile brown and white shrimp. Production ranged from 50 to 200 pounds per acre with no feeding or fertilization, proving the feasibility of pond cultivation.

In the summer of 1964 four $\frac{1}{200}$ acre concrete block ponds were built beneath the main laboratory building. White shrimp were stocked at a high rate of 120,000 per acre since they were to be fed different feeds at varying percentages of their body weight. The purposes of this study were:

1. To determine the maximum number of shrimp capable of being held.
2. To determine which feed could best be utilized.
3. To determine which rate of feeding would give the best growth.

When after 48 days, the ponds were drained it was found that (1) the stocking rate was too high, (2) neither feed was conclusively better than the other, and, (3) neither feeding rate was high enough. In September when this experiment was concluded, the ponds were again stocked; but the experiment was abandoned because of the 1964 hurricane and the laboratory was evacuated for five days.

In 1965, the $\frac{1}{200}$ -acre ponds were stocked at a lower rate of 12,000 brown shrimp per acre. This was the same rate at which the $\frac{1}{4}$ -acre dirt pond had been stocked. The purposes of this study were:

1. To determine a better stocking rate
2. To determine maximum rate of feed for best utilization.
3. To determine which species of shrimp was best adopted for supplemental feeding.

After 60 days the ponds were drained and it was found that (1) production was lower than the previous year and this stocking rate was too low; (2) 10 percent of body weight fed daily was not too high at this stocking rate; and, (3) white shrimp are apparently better suited to pond cultivation and supplemental feeding. A summary of this work is seen in Table 1.

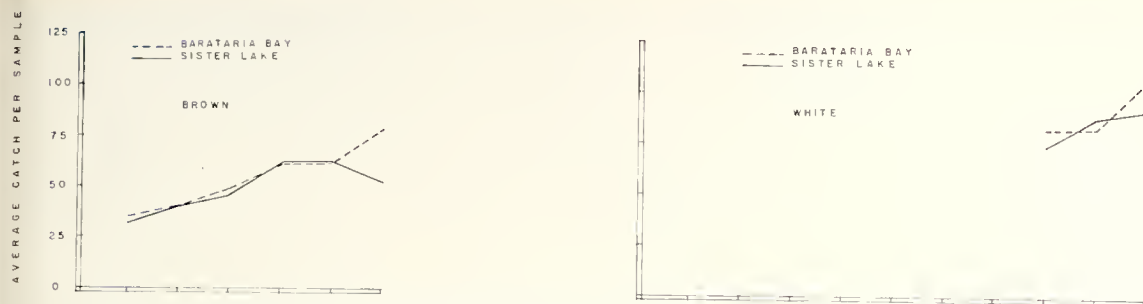


Fig. 1. GROWTH COMPARISON OF SHRIMP IN THE BARATARIA BAY AND SISTER LAKE AREAS, 1965

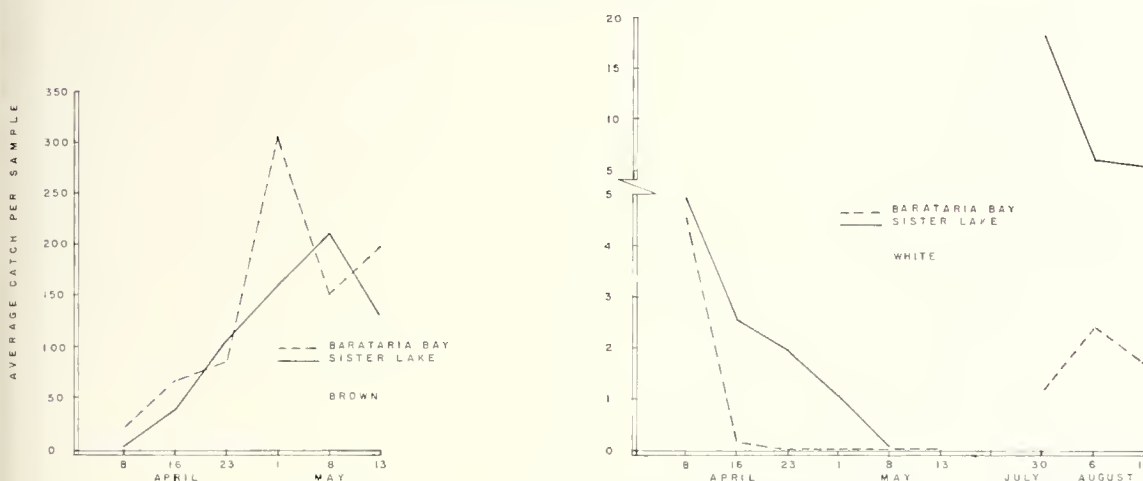


Fig. 2. POPULATION DENSITY COMPARISON OF SHRIMP IN THE BARATARIA BAY AND SISTER LAKE AREAS, 1965

Table 1.
POND FEEDING STUDIES

Pond	1964—White Shrimp				1965—Brown Shrimp			
	C-1	C-2	C-3	C-4	C-1	C-2	C-3	C-4
Number Stocked	600	600	600	600	60	60	60	60
Number Recovered	476	491	525	528	52	54	55	56
Mortality, %	20.7	18.2	12.5	12.0	13	10	8	7
Stocking Weight in Grams	908.7	809.5	826.6	871.3	105	66	110	69
Recovery Weight in Grams	1301.7	801.6	1029.0	1271.5	217	235	185	191
Growth Weight in Grams	393.0	....	202.4	400.2	112	179	75	122
Feeding Rate, %	3	1	1	3	5	10	5	10
Feed	Pellets	Mullet	Pellets	Mullet	Pellets	Pellets	Pellets	Pellets
Feed Conversion	4.3	....	7.1	3.8	4.3	5.6	5.8	6.0
Gain: Pounds/Acre/Day	3.8	....	1.86	3.67	0.82	1.32	0.55	0.89

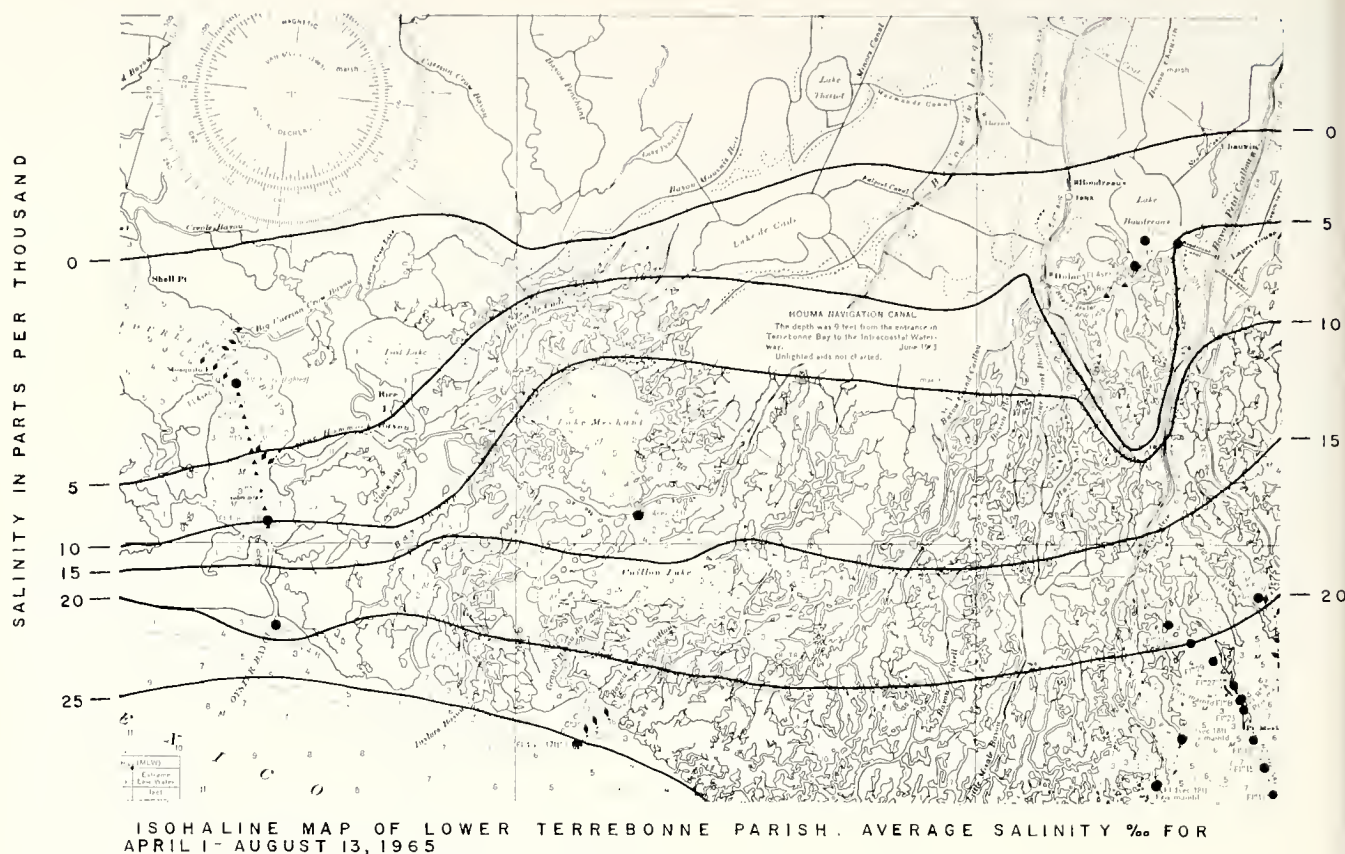


Fig. 3. SISTER (CAILLOU) LAKE SHRIMP STUDY AREA

COOPERATIVE EDUCATIONAL PROGRAM

This program continued to increase in popularity as in previous years since it was established in 1960. Nearly all of the available dates for handling University, College, High School, and



It is difficult to seine for fishes and other marine animals without getting wet. This is a part of the "field work" included in the short courses conducted at the Marine Laboratory. All work is under the supervision of a biologist and the group's teacher.

Civic groups were utilized during the spring periods of this Biennium. Due to the intensive shrimp studies being conducted in the early spring while the shrimp are moving into side waters, it was necessary to close the period from March 1 through April 15 of each year for the various visiting groups. Interested groups are encouraged to come either before or after this particular period of the year, and selective lecture, laboratory and field sampling schedules were developed for their interest. The program in general falls into several categories as follows:

1. Visiting professional researchers who are furnished working space and equipment in order to carry out independent research.
2. Visiting University and College science classes activity in marine biology or geology. Such groups are generally under the direction of their professors and the laboratory furnishes guided field collecting trips, lectures, visual education, and demonstrations of current research or local animals. Such trips are short term, one or two day events.
3. Visits from High School science classes and science clubs. These, like University classes are under the direction of their teachers. Laboratory personnel furnish the same program for High School groups as for Univer-

sity classes except the detail and complexity of the information offered is adjusted to the age level and experience of the group. In all cases, preference is given those High School classes whose teacher has previously attended an organized short course in marine biology at this or other laboratories.

4. A six day short course in marine biology is offered on two successive weeks in August for qualifying High School Teachers.

This course is in cooperation with the science section of the Louisiana Department of Education. Program is jointly arranged by laboratory and Department of Education personnel and the participating teachers are selected by the Education Department. The basic plan of the course not only includes intensive instruction to the High School teacher group but includes subsequent visits to the laboratory by the individual teachers and their classes. All interested parties should make inquiries and applications to Science Section, State Department of Education, Baton Rouge, La.

Two one-week short courses were held for qualifying High School Teachers in August 1964. However, changes in personnel assignments in the State Department of Education in early 1965 did not permit adequate time for new personnel to complete the many arrangements required of them for the 1965 short courses. Nevertheless, current planning is to re-establish and continue these two short courses in August 1966, Hurricane "Betsy" damages notwithstanding, if it is at all possible. The Wild Life and Fisheries Commission's Marine Laboratory facilities and staff will be ready to continue its cooperative effort even if more improvisation than normal is required due to "Betsy's" extended aftermath.

HYDROGRAPHY

The Hydrographic section is concerned primarily with recording the various chemical and physical phenomena in the Barataria Bay region. Most of the sampling is done by continuous recording instruments; however, in order to sample water conditions in the outlying areas, boats and portable equipment are utilized. Hydrographic and climatic data taken by laboratory personnel are augmented by information supplied by private industry and the federal government.

With the ending of the present biennium (1964-65), eight years of continuous air and water temperatures, seven years of continuous barometric pressures, rainfall, and tides, six years of continuous wind speed and direction, and five years of continuous salinities have been recorded at the laboratory.

From these years of data, daily, monthly, seasonal, and annual highs, lows and averages are calculated. Normals and extremes are determined for each of these phenomena, and anomalies rec-

ognized and compared with variations in the results of biological sampling. The longer the sampling program continues, the closer we will come to understanding what and climatic conditions are normal during a particular season. Possibly, conditions for commercially important marine animals may, in time, be determined.

Weather and water conditions during the biennium 1964-65 varied somewhat from the 1962-63 period. In 1965, water temperatures were slightly higher than the previous three years, northerly winds weaker, river stages higher, and consequently, salinities lower during 1965. Annual rainfall in 1965, was less than that in 1963 and 1964; however, the rain gauge at the laboratory was destroyed during Hurricane "Betsy" and no readings were made during this period. Record breaking winds, tides and barometric pressures were experienced during "Betsy". A low of 28.15 inches of mercury was recorded at 9:45 P.M. on September 9, 1965 (See Fig. 1). From 6:00 P.M., to 9:45 P.M., the mercury fell one inch. Our tide gauge was washed off its stand, but the chart was found later. According to this chart, the tides in Barataria Pass reached a high of 91 inches above mean sea level at 11:30 P.M. Fortunately, the high winds and low barometric pressures associated with Hurricane "Betsy" occurred during what would have been a low tide period. The tide rose to a high of 91 inches within three hours from a low for the day of seven inches above mean sea level. The 91 inch high tide was later tentatively confirmed by a high-water mark found on one of the remaining ground level laboratory structures. The wind gauge operates on AC power; since all power was shut off prior to the storm, no continuous wind recordings were made during the storm. Nevertheless, wind speeds exceeded the 100 mph maximum limit of the gauge as shown on the chart tracing.

Large scale erosion took place on the Gulf beach. Tons of sand were removed from the beach and washed inland. The bay beach was not appreciably altered due to the vegetation and different sediment type. Of course, the Gulf beach was subjected to much greater wave and wind attack than was the bay beach.

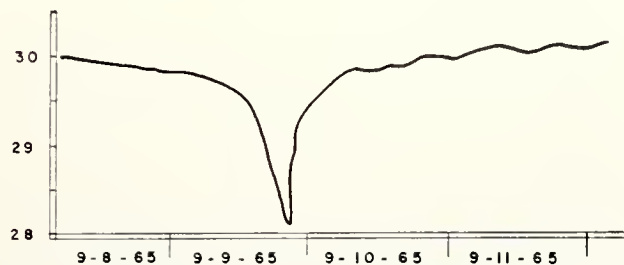


Fig. 1. BAROMETRIC TRACING FOR
"HURRICANE BETSY" AT
MARINE LABORATORY



Sampling for shrimp and other marine animals in open water is being done aboard the Marine Laboratory's vessel "Marine Research" during a three-day short course for a visiting high school group. The vessel is used chiefly for the laboratory's scientific program in the larger bays and offshore.

Surface Water Temperatures

The data in Table 1 shows comparatively the monthly average surface water temperatures on

an annual basis during the past four years, 1962-65, with the past 8-year monthly average.

During 1962, 63, and 64, water temperatures were below normal (considering the 8-year average as normal), while those in 1965 were above normal. Generally, water temperatures are lowest in January and December, and they are progressively warmer during each succeeding month through July or August. Two exceptions are noted in Table 1. In 1962, the temperature in March is lower than the preceding February, and in 1965, the temperature in February is lower than the month of January. Air temperatures were also lower in March of 1962 and February of 1965 than in their preceding months. A probable explanation for the drop in temperatures during these months is increase in northerly winds in March of 1962 and February of 1965 (see Table 2) over the preceding months. The low temperatures in January and December of 1963 correspond to very strong north winds occurring during these two months and the high January 1965 temperature corresponds to very weak north winds during this month.

Table 1.

GRAND TERRE MONTHLY SURFACE WATER TEMPERATURE AVERAGES

	1962	1963	1964	1965	8 year average 1958-1965
January	13.35*	10.80	11.82*	16.31	12.87
February	16.80	11.50	13.48	14.89	14.29
March	16.35	18.89	17.55	16.37	17.61
April	21.95	23.49	21.70	24.42	22.43
May	26.75	25.44	25.85	25.45	26.03
June	27.75	26.07	29.35	28.45	28.63
July	29.40	27.61	28.98	28.90	29.88
August	29.45	28.54	28.48	28.26*	29.60
September	28.00	26.51	27.93*	26.44	27.90
October	24.25	22.85	20.81	22.08	24.40
November	16.35	16.25	19.54	20.63	18.81
December	12.90	9.08	16.05	14.60	13.92
Annual Average	21.94	20.59	21.80	22.23	22.20

*Denotes 5 or more days of missing data.

Surface Winds

Winds from 1962 through 1965 are shown in Table 2. The wind directions are given in degrees and the numbers under the direction are a result of the formula (wind speed $\times$ wind duration $\div$ 2). This method of presentation allows the variable of speed and duration to be shown along with direction. A wind blowing for 10 hours at a speed of five mph would have a numerical value of 25. However, a 10 mph wind blowing for five hours would also have a numerical value of 25. Although a composite number by itself has no sig-

nificance, comparisons of wind action can be made with a group of such numbers.

From these tables it can be seen that southerly winds arrived at Grand Terre in March of 1963 and in April of 1962, 1964, and 1965. The time of arrival of warm southerly winds is important to the biologist in his work with marine animals.

Southerly winds are the prevailing winds from early spring until September which coincides with a lowering of water temperatures in September. For the six years of record, northerly winds have arrived in September and are the prevailing wind through the following February or March.

Table 2.
SURFACE WINDS (Wind Speed x Wind Duration ÷ 2)

	0-45*	45-90	90-135	135-180	180-225	225-270	270-315	315-360	Var. (Hrs.)
<i>1962</i>									
January	1,096	481	523	687	264	124	776	906	36
February	728	541	370	1,076	691	382	24	120	32
March	1,208	680	514	638	343	207	400	1,078	8
April	760	160	515	1,853	508	242	73	484	29
May	331	56	570	1,454	845	175	98	447	76
June	232	0	444	593	651	368	0	0	186
July	158	32	44	168	814	301	610	491	65
August	395	385	600	617	611	279	158	178	47
September	907	698	446	340	373	62	34	94	72
October	861	567	740	713	377	227	45	824	31
November	965	1,125	316	242	384	173	301	1,017	6
December	1,298	894	208	199	354	95	45	727	77
TOTAL	8,939	5,619	5,290	8,580	6,215	2,835	2,564	6,366	665
<i>1963</i>									
January	1,677	876	431	320	364	89	279	857	57
February	1,349	625	518	207	228	495	370	1,123	42
March	333	213	1,460	1,370	282	230	60	698	57
April	340	218	819	1,662	1,112	41	283	181	8
May	248	312	421	341	1,899	359	132	88	105
June	45	195	291	686	1,242	329	50	198	150
July	0	0	438	701	873	1,114	436	282	155
August	348	61	129	555	1,050	517	260	686	118
September	1,360	1,304	927	472	125	84	69	350	48
October	929	1,902	845	148	60	24	0	376	72
November	1,713	719	996	595	0	168	0	474	52
December	2,150	1,176	242	202	214	211	388	1,169	38
TOTAL	10,492	7,601	7,517	7,259	7,449	3,661	2,327	6,483	902
<i>1964</i>									
January	428	1,381	490	184	510	262	388	1,117	54
February**	497	1,160	338	135	198	896	603	875	50
March**	528	248	683	264	218	0	20	358	72
April	317	80	857	1,945	344	63	0	88	53
May	287	194	425	1,721	254	103	136	183	92
June	219	92	44	1,067	687	80	15	298	83
July	58	366	292	320	836	588	172	63	101
August	30	90	122	472	974	220	362	206	105
September	409	1,104	834	284	0	0	39	645	30
October	1,016	859	330	56	0	181	173	672	6
November	1,080	628	578	476	272	0	0	295	38
December	1,504	507	326	525	414	0	24	266	31
TOTAL	6,433	6,709	5,319	7,449	4,707	2,393	1,932	5,060	715
<i>1965</i>									
January	691	592	614	707	175	186	282	624	11
February	1,170	819	696	344	176	110	396	48	45
March	706	572	463	616	272	285	432	384	29
April	207	220	744	1,438	388	48	0	368	14
May	121	0	2,076	1,146	164	0	36	46	10
June	89	165	835	906	582	114	78	0	36
July	59	128	281	191	770	418	219	217	87
August	75	47	434	807	522	196	404	56	86
September**	1,065	624	1,351	145	146	0	0	0	30
October	854	1,534	418	66	0	222	348	443	12
November	570	1,184	615	223	602	88	30	92	16
December	1,280	650	450	244	75	36	191	356	12
TOTAL	6,967	6,535	8,977	6,833	3,872	1,703	2,416	2,634	389

*Directional Source of winds in degree segments

**Denotes 5 or more days of missing data.

Surface Salinities

Tables 3, 4 and 5 contain monthly average salinities for the past four years taken at (1) St. Mary's Point located at the northern extreme of Barataria Bay, 10 miles north of Grand Terre Island, (2) the Marine Lab located at the southern extreme of Barataria Bay on Grand Terre Island, and (3) the Freeport Sulphur Mine located seven miles out in the Gulf of Mexico. The Gulf salinities are furnished to the lab by the Freeport Sulphur Company. These three stations are located roughly in a north-south line and the distance from the Freeport Mine to St. Mary's Point is 17 miles.

Mississippi River stages shown in Table 6 have a direct influence on surface salinities at the Freeport mine and at Grand Terre. Salinities at St. Mary's Point are influenced more by rainfall and discharge of the nearby bayous than by Mississippi River discharge.

During the years of record, salinities are lowest at the Freeport mine and Grand Terre during the spring months. This coincides with high Mississippi River discharges which dilute salinities. There are two general rises in river stages during the year (river discharges are not used as they are not available for the lower part of the Mississippi River): a major one during the spring of the year and a slight rise in August or September. Both of these rises can be directly correlated with lower salinities. However, there is a lag between a high river and the dilution of salinities in the Barataria Bay region because of the distance over which the water must travel. The length of time for this lag depends on the prevailing winds and currents.

Salinities at St. Mary's Point from 1962-1965 generally conformed to the rainy and drought seasons (see Table 7). There were low salinities during the late winter and summer rainy seasons and high salinities during the spring and fall drought seasons.

Table 3.
SURFACE SALINITY: ST. MARY'S POINT
Monthly Average ‰

	1962	1963	1964	1965
January	3.4	17.05	8.6	12.13
February	9.4	11.13	7.2	9.80
March	12.3	18.40	4.5	11.17
April	10.5	21.83	5.7	13.18
May	12.9	19.84	7.9	14.83
June	13.1	17.33	10.7	15.70
July	14.4	10.75	6.6	15.02
August	21.7	11.63	6.8	13.26
September	22.2	19.22	21.9	11.90
October	22.5	20.82	15.8	—
November	20.6	15.07	19.08	—
December	18.5	6.90	15.4	—
Annual Average	15.12	15.83	10.90	13.00

0/00 = Salinity expressed as parts per thousand, total salts

Table 4.
SURFACE SALINITY: GRAND TERRE ISLAND
Monthly Average ‰

	1962	1963	1964	1965
January	21.10	29.35	24.88	23.16
February	20.40	28.70	24.57	24.47
March	21.20	26.64	23.32	22.45
April	18.70	21.60	15.52	16.50
May	15.50	25.30	14.57	14.68
June	17.30	24.60	16.31	14.04
July	23.80	24.75	19.39	24.80
August	26.30	23.02	24.98	23.67
September	23.40	27.10	27.55	24.23
October	29.66	30.06	26.01	23.96
November	29.50	25.06	27.10	27.19
December	28.90	20.62	25.77	24.31
Annual Average	22.97	25.56	22.50	21.96

Table 5.
SURFACE SALINITY: FREEPORT SULPHUR MINE
Monthly Average ‰

	1960	1961	1962	1963	1964	1965
January	—	30.6*	25.9*	30.5	31.93	26.95
February	—	29.4*	21.8*	30.6	31.28	28.11
March	26.9*	24.1*	25.3*	26.6*	26.84	26.11
April	23.7	24.0*	—	21.5	17.84	17.01
May	23.4	18.9*	—	26.6	15.96	19.24
June	24.1	14.3*	—	28.78	16.73	21.31
July	25.0	24.4*	26.1	29.34	23.37	26.18
August	25.2	22.9*	26.4*	29.99	26.60	26.77
September	24.7*	25.3*	26.6*	28.32	27.90	27.01
October	26.7*	25.7*	27.9*	29.63	29.82	26.81
November	28.6*	27.7*	29.3*	31.03	28.87	27.40
December	30.3*	26.4*	29.7*	31.74	29.08	—
Annual Average	—	24.14	—	28.54	25.61	24.81

*Denotes 5 or more days missing data.
 Salinities taken once daily at a depth of 15 feet.
 Salinity determination made by titration with silver nitrate.

Table 6.
MISS. RIVER: HEAD OF PASSES
MONTHLY AVERAGE RIVER STAGES

	1962	1963	1964	1965
January	2.16	8.89	0.40	1.45
February	2.82	0.70	0.82	1.90
March	3.55	2.30	2.23	2.39
April	4.04	2.90	3.33	3.47
May	2.93	1.80	3.46	3.18
June	2.16	1.93	2.08	2.60
July	1.82	1.65	2.02	2.24
August	1.91	1.61	1.96	2.17
September	1.93	2.07	2.15	2.74*
October	1.59	1.54	1.92	...
November	1.17	...	...	...
December	0.83	0.56	1.39	...

Reading are in feet above msl.

*5 days missing

Table 7.
GRAND TERRE ISLAND: TOTAL MONTHLY PRECIPITATION IN INCHES

	1962	1963	1964	1965
January	3.41	6.02	5.26	3.23
February	0.90	3.98	9.55	6.38
March	0.86	0.70	4.65	3.11
April	1.48	0.14	5.14	2.08
May	0.00	1.35	2.07	0.49
June	7.29	12.11	7.56	6.14
July	6.18	5.00	7.29	7.81
August	3.88	1.17	6.67	5.01
September	1.78	8.79	2.43	2.86*
October	2.00	0.35	4.44	.70
November	3.00	7.38	4.47	1.10
December	1.82	4.05	.87	4.30
Annual Total	32.10	51.04	60.40	43.21
Monthly Average	2.68	4.25	5.03	3.60



Fig. 2. COMPARISON OF HURRICANE TIDE AT GRAND TERRE WITH A NORMAL SEPTEMBER TIDE

Figure 2. Comparison of Hurricane Tide at Grand Terre with a Normal September Tide.

Tides

Tides at Grand Terre are chiefly diurnal, generally there being only one high and one low tide daily. The tidal range here averages slightly over 11 inches.

The year of 1965 was unusual in that barometric pressures were higher than during the previous three years, and average tides were also higher than during this same period. The 1965 higher average tides were due to Hurricane "Betsy" and also may be due partly to the unusually high temperatures in 1965 which would affect water densities.

The velocity of Hurricane "Betsy", once it began to move into the South Louisiana coast after moving rapidly across the Gulf from Florida, was one of the most varied in Louisiana's hurricane history. Because of its northward velocity, seas were not as high as would be expected if "Betsy" had lingered off the coast. Hurricane "Carla," also a September storm, was in the Gulf of Mexico south of the Louisiana Coast for a longer period than "Betsy". The tidal chart (Fig. 2) derived from data recorded at the lab indicates how the seas built up before "Carla" hit the Texas coast. Tidal heights during "Betsy" were only a few inches above normal prior to September 9. Interestingly, the tidal height at the Marine Lab during Hurricane "Hilda" in October 1964 was

only 30 inches msl, although high winds were experienced during that period. The storm moved inland west of Grand Terre Island in the vicinity of Morgan City. At the Sister (Caillou) Lake Camp located approximately 60 miles west of the Marine Lab, good water marks were found at about 11.5 feet msl. Perhaps the natural levees of Bayou Lafourche and their associated land masses as well as other intervening land masses and the remoteness of the "storm center" contributed to this limited tidal level at the Marine Lab.

Services to the Oystermen

Damage to oysters and oyster bottoms by industrial activities continues to be of major concern to the oysterman. During the biennium of 1964-65, the number of leases and acreage experiencing damages virtually doubled over the preceding period. Some 88 leases totaling 2,294 acres were examined compared to 1,166 acres on 44 leases during the 1962-63 period. A summary of the various categories of complaints, giving the number and percent composition, for these two biennial periods is given in Table 8. It is evident from this that there were increased industrial activities and probable negligence since the "Oily taste in oysters" and "Seismic operations" categories increased markedly during this last biennium. Percentage-wise, most of the other categories were reduced. This probably also represents an increased awareness and better husbandry of oysters and oyster leases by the fishermen. An appraisal of complaints such as these and various related inspectional reports during recent years strongly suggests that man's negligence and/or the failure to respect the rights of others is the primary cause of such problems. A concerted effort on the part of some interests is helping in the recognition of this broad problem.

Damaged leases are examined by the Louisiana Wild Life and Fisheries' personnel at no cost to the oysterman as an extension type of service to this fisheries industry.

Table 8.
OYSTER DAMAGE COMPLAINTS

Type of damage	1962-63		1964-65	
	Number	Percent	Number	Percent
Seismic operations	0	0	7	12.73
Silting & dredging	14	51.85	19	34.54
Oily taste in Oysters (Pollution)	2	7.40	13	23.64
Ecological changes	0	0	3	5.45
Exam. prior to dredging	1	3.70	1	1.82
Unknown causes	3	11.11	1	1.82
No damage found	0	0	4	7.27
Tug & Barge Damage	7	25.92	7	12.73
TOTAL	27	99.98	55	100.00

COASTAL WASTE CONTROL

The purpose of the Coastal Waste Control program is to prevent the pollution of the coastal waters and marshes. By legislative act, the enforcement of the Coastal Waste Control program was designated to the Louisiana Wild Life and Fisheries Commission by the Stream Control Commission.

The primary purpose of this program is the enforcement of Stream Control Commission regulations and pollution laws of this State in the coastal area. Much of the function of this section is involved in supervising waste disposal of the vast oil, gas and sulphur industrial complex associated with Louisiana's coast. Though the value of this great mineral industry makes it of prime economic importance, it is necessary not to lose sight of the value and need for the protection of the \$100,000,000.00 seafood industry using the same area. Enforcement is deemed necessary by the Commission because of the high productivity of both minerals and fishery products; every reasonable effort must be made to allow both industries to operate in the same area without serious conflict.

The routine functions are carried out by two inspectors and two boat captains with fully equipped patrol boats on a year-round patrol of the S. E. coastal area from S. W. of Houma to the Mississippi State line. These patrols also include an area extending 3 miles offshore. While on routine patrol, constant radio communication makes it possible to handle emergency pollution complaints.

Routine Patrol

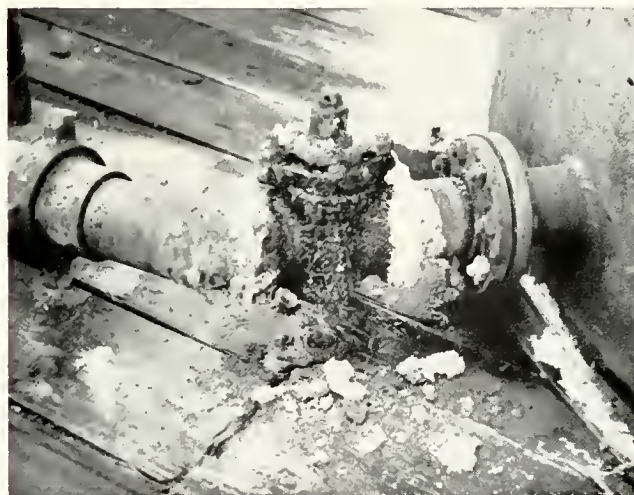
1. Contacts are made by phone or otherwise with the oil company field representative and they are requested to accompany us on the inspection of the fields.
2. The inspection group then proceeds to each tank battery which is carefully inspected for oil spillage resulting from bleedwater discharge, waste pit discharges and general requirements of the regulations. It is now known that the most feasible and positive disposal of oil field waste is by means of an adequate burning pit with a continuous burning pilot flare with the exception of disposal wells. All drilling and workover rigs are checked for loss of oil and any violations of regulations. While enroute in the field any oil slicks encountered are traced to their source where immediate correction of the problem is directed by the enforcing officers.
3. Photos are taken of all major violations and, when necessary, samples are taken. These photos become a permanent record in the

New Orleans office and the Stream Control Commission office in Baton Rouge. Any samples taken are processed in the Baton Rouge laboratory for technical analysis.

4. Four copies of the oil field reports are made. These are signed by the inspector and the company field representative. The field representative is given the first carbon copy to be forwarded to his district office. The original report is filed as a permanent rec-



One of the Wild Life and Fisheries Commission's Coastal Waste Control Inspectors is shown with a company representative completing a favorable report at the conclusion of their joint inspection of the company's production facilities. Standard procedure requires that the company's field superintendent, etc., sign the report acknowledging that he witnessed any violations listed in the report.



Here is a prime example of the types of negligence confronting the Coastal Waste Control Inspector. As it is now, a small amount of oil and oil field brine is lost regularly contributing to a minor degree of pollution. However, there is a strong possibility of this valve rupturing whereby the entire contents of this 1000 barrel capacity "gun barrel" would be discharged onto the surrounding marsh or water. Such a loss could amount to as much as 500 barrels of raw crude oil with the remaining volume being oil field brine.



This view, typical of heavy production in the south-eastern coastal area, shows an extensive complex of oil well flow lines from the field to the tank battery (background) consisting of the separation and storage facilities. When lines such as these become deteriorated, frequent breaks occur resulting in oil pollution of the area. Better compliance with existing regulations by the operators making frequent inspections would minimize this source of pollution.

ord in the New Orleans office. The second carbon copy is sent to Baton Rouge with attached photos and sample analysis. The third carbon copy is kept aboard each patrol boat for future reference when rechecking corrections on previous violations.

5. While enroute from field to field, all oil tows encountered are checked for oil losses, which may occur from leaks, manifold openings and loading pumps.
6. Extra duties performed by this section include assisting the biological section in mak-

ing oyster damage reports by transporting equipment and personnel to the damaged site and assisting in the taking of samples of mud, oysters, water, salinity, etc. When oil pollution is involved with a damage complaint, a joint oil field inspection report is made concerning the installation involved.

7. The C. W. C. officers often use Commission aircraft for patrolling the heavily industrialized areas where pollution has been reported.
8. Maintenance of Marine Equipment.
 - a. Both patrol boats are maintained in first class condition at all times in order to be ready to handle all complaints.
 - b. It is the duty of the boat captains and inspectors to make minor repairs such as changing oil filters on engines, spark plugs, points, condensers, coils, wheels and shafts. All major repairs such as engine change, rework hull and paint work are done at the Commission's West End Wharf.
9. Extra details performed in cooperation with other divisions and departments require additional equipment and personnel to keep pace with the increased demands on this section. One of the more demanding additional duties is aiding cooperating agencies in the sampling for pesticidal or bacterial pollution. It has become necessary to cooperate with the U. S. Public Health Service and the State Board of Health in securing samples and making various tests over a vast area of the coastal parishes of this State. This is done to determine the location and extent of pollution arising from

Aerial surveillance by Commission Personnel provides a rapid means for the gross inspection of violations of statutes and Stream Control Commission regulations. Here, the heavy black drifts are actually raw crude oil lost from these oil storage and transportation facilities. This violation was reported immediately to the responsible company which took emergency action to correct this condition.



insecticides and industrial wastes. This new and additional work load strongly points to the need for additional crews and patrol boats in order to keep abreast of expanding work requirements.

In conclusion, this Commission is pleased to acknowledge the increasing awareness, interest and assistance on the part of local and parish

civic and official groups. Even so, a greater response is required if we hope to keep abreast of the developing and expanding industrialization occurring in this area. Therefore, this Commission will continue to cooperate with all groups seeking the control of industrial and related pollution of these nursery grounds, so rich in renewable natural resources.

Refuge Division

IT IS WITH PLEASURE that the Refuge Division reports that considerable progress has been made during the past two years in the development and management of approximately 250,000 acres of coastal marsh wildlife refuge and public hunting areas. This progress was accomplished in spite of two extremely severe hurricanes which struck the Louisiana coast during 1964 and 1965.

Hurricane Hilda entered the Louisiana coast just east of the 83,000 acre Marsh Island Wildlife Refuge in Iberia Parish during 1964. This storm carried tides of three to four feet above sea level ahead of it and inundated Marsh Island and State Wildlife Refuges located just west of the storm's path.

Extensive wind damages were incurred at Marsh Island to our trapping and patrol camps as well as to our main headquarters building and boat house. These facilities were adequately covered by insurance and repairs were made immediately after the storm. Materials and supplies were purchased to rebuild the patrol camps lost and Refuge Division personnel have started construction of these facilities.

At the 15,000 acre State Wildlife Refuge, the storm damage was confined to minor damage on the main headquarters building and boat house and one trapping camp was destroyed. It is also being rebuilt by Refuge personnel.

In addition to damages to buildings, Hurricane Hilda caused considerable damage to our waterfowl food plants primarily widgeon grass (*Ruppia maritima*) which grows in profuse stands in ponds on Marsh Island and State Wildlife Refuges.

In September, 1965, Hurricane Betsy entered the Louisiana coast in the vicinity of our 66,000 acre Pass-a-Loutre Waterfowl Management Area located at the extreme end of the Mississippi River in Plaquemines Parish. Storm tides up to four feet occurred across the area and caused extensive damages to our nine public waterfowl hunting camps as well as to our storage and main headquarter facilities. The Refuge Division maintenance crew was able to restore six of the public hunting camps in time for the 1965-66 waterfowl season.

Hurricane Betsy also caused severe damages to stands of aquatic vegetation on the Pass-a-Loutre area; however, some of the more desirable waterfowl food plants which grow on the mud flats and Pass banks had matured prior to Hurricane Betsy and were not destroyed.



ALLAN ENSMINGER
Chief

In addition to the extensive repair and renovation work carried out on the Pass-a-Loutre area, personnel from the Refuge Division assisted local officials with the massive cleanup and restoration work in the Pilottown and Venice areas. Various pieces of this Division's marine equipment, such as amphibious draglines, barges and tug boat were used to remove dead animals, debris and flood waters from the residential section of Venice in order to cope with the public health hazards created by this disastrous hurricane.

The 83,000 acre Rockefeller Wildlife Refuge in Cameron and Vermilion Parishes escaped damages from the hurricanes and personnel have carried on routine improvement programs during the past two years.

Improvement work at Rockefeller has been directed toward the installation of water control structures and levees around much of the marsh land which had previously been subjected to tidal conditions. The unstable condition is not conducive to production of desirable waterfowl food plants. Through intensive control of water levels and salinities, it has been possible to produce certain forms of waterfowl food plants which are highly attractive to wintering waterfowl. Two distinct management approaches have been devised by which the vast coastal marsh holdings of the Refuge Division have been improved.

On the Rockefeller and Marsh Island Wildlife Refuges, an extensive impoundment program was begun during the mid fifties by which vast areas were placed under intensive management. These impoundments can be maintained as brackish water areas having a salinity range of 3,000 to 8,000 ppm which is conducive to the production of widgeon grass or they can be dewatered to encourage a growth of seed producing plants such as millet (*Echinochloa crusgalli* and *Walteri*) and fall panicum (*Panicum dichotomiflorum*).

In addition to the impoundments, extensive marsh improvement work has been carried out by installation of low level sill dams or weirs strategically located in tide water drainage systems on Marsh Island, State Wildlife and Rockefeller Refuges. These structures were installed by Refuge personnel and the crest set at an elevation of six inches below the average marsh level. This elevation was selected in order to partially stabilize water conditions in the marsh and to prohibit the complete drainage of ponds during period of low tide. This work has been aimed primarily toward increasing the production of widgeon grass in marsh ponds and three-cornered grass (*Scirpus olneyi* and *robustus*) in marsh areas. Three-cornered grass is a preferred food plant for blue and snow geese as well as for muskrat and nutria. During the past two years, the refuges have continued to carry a large percentage of the world's blue goose population during the winter months as well as a substantial portion of the total Mississippi Flyway duck population.

Prior to the development work on the refuges, these areas seldom wintered more than 150,000 ducks. Aerial inventories made by refuge research personnel showed that the areas provided winter habitat for approximately 750,000 ducks and 120,000 blue and snow geese each year.

Public waterfowl hunting is an important phase of the management program on Pass-a-Loutre and, in spite of the severe damages incurred by Hurricane Betsy to many of the marsh ponds, a good waterfowl season was enjoyed by a large number of the Louisiana duck hunters during the 1965-66 season.

A lease has been renewed on Coulee Wildlife Refuge located in Morehouse Parish and this area carried approximately 20,000 ducks which played an important roll in holding waterfowl in the entire Monroe area.

An intensive marsh burning program has been carried out on the refuges to encourage the establishment of desirable waterfowl and fur bearing animal food plants. The scientific use of fire has been found to be the most practical means under which dense stands of marsh plants can be managed in order to favor the more desirable plants.

Trapping operations have been carried out with nutria being the primary fur bearer sought by the trappers. Muskrat populations continue to remain low; however, there are signs that these fur bearers are making a slight recovery on the State Wildlife Refuge and management techniques are being employed to encourage the establishment of a trappable population on the area.

The most perplexing problem that has faced the Refuge Division during the past two years has been the proper management of mineral operations on the Rockefeller, Marsh Island and Pass-

a-Loutre areas. Numerous mineral leases have been developed on these areas during past years and extreme care must be exercised to prevent damages to the areas. Marsh Island and Rockefeller Refuges both were donated to the state and contain a set of terms and conditions by which these areas are to be managed. With the ever increasing problem of land utilization throughout the state, it is becoming more and more important the large coastal marsh areas be maintained in their highest productive wildlife conditions.

The general approach used by most mineral operations along the Louisiana coast in reaching drilling sites has been to excavate flotation canals 60 to 80 feet wide and 8 feet deep to permit the drilling rig and other heavy equipment to be floated to well sites. This type of operation causes a direct loss of many acres of marsh in the canal and also creates water management problems involving drainage, tidal flow, and rapid changes in water levels and salinities. These conditions tend to reduce the quality of the marsh for wildlife by causing drastic changes in plant communities.

The other alternative for an oil company to reach drilling sites is through the construction of road ways. This type of mineral development is somewhat more expensive than the use of flotation canals; however, the benefits to wildlife are very apparent. A stipulation requiring that mineral development be carried out through a system of road construction has been included in all new leases issued on the Rockefeller Wildlife Refuge, and numerous roads have been constructed on the area by mineral operators. One oil company has constructed a long road into the impoundment on Marsh Island and additional mineral exploration in the impoundment area will be carried out by installation of roads. Where road systems are impractical, every effort is made to follow natural water courses to prevent a net work of canals which would be detrimental to the areas. In spite of the many problems associated with the coordination of mineral operations and wildlife programs, it has been possible through research findings by Refuge personnel to increase food supplies and habitat conditions on the refuges.

These improvements have brought about an increase in wildlife usage. One of the important by-products of the marsh management program on Marsh Island has been the increased productivity of this area as a shrimp nursery grounds following the installation of the weirs. These structures provide a relatively stable water condition which is desirable for young shrimp during the summer months. During the fall these shrimp, which have matured to commercial size, migrate from the marsh areas into Vermilion Bay and the offshore waters along the Louisiana

coast. Sport fishing has been immensely improved on Marsh Island as a result of the numerous water control structures, and large catches of shrimp are made through the use of cast nets by local sportsmen.

Operations of a routine nature on all of the refuges during the past two years have involved the patrolling of the individual areas against poaching and other illegal activities. The primary problem along this line has continued to be the prevention of alligator hunting. Even though the La. Wild Life & Fisheries Commission saw fit to close the alligator season in Louisiana in an effort to reestablish this important form of marsh wildlife, there has been an illegal trade in alligator skins. The high price paid for illegal skins has attracted poachers and necessitated extensive patrol activities during the warm months on the coastal refuges.

One of the most important phases of the Refuge Division activities has been to conduct research studies by trained personnel into factors relating to the production and management of vegetative types in order to increase wildlife usage and carrying capacities. This program has been extremely successful and has benefitted private land managers in the proper handling of environmental conditions for the maximum benefit of wildlife on their marshes. Information gained through the research program has been published in papers presented at the Southeastern Association of Game and Fish Commissioners as well as the North American Wildlife Conference and the Mississippi Flyway Council.

The coastal marsh refuges are considered to be some of the most highly managed and productive waterfowl areas on the Continent, and it is the intention of this Division to continue all of our management programs to assure that these

areas will be perpetuated and developed to their fullest potential. Revenues derived from mineral operations on the areas will be used to benefit future generations interested in wildlife not only on the coastal marsh refuges, but will also be used where applicable to purchase and improve wildlife areas throughout the state.

ROCKEFELLER WILDLIFE REFUGE

NED W. CRAIN
Refuge Supervisor

Humble Canal

Several years were spent investigating the methods which could be used to repair the levees along Humble Canal on Rockefeller Refuge or methods of retarding the erosion. Bulkheading or rip-raping was considered but cost estimates proved this method not economically feasible. The use of a suction dredge was also considered with the material removed from the canal to be used to form levees. However, ample material was not available in the Humble Canal.

Final plans were then made to place new levees along the canal by excavating new canals on the opposite sides of the existing levees and placing the spoil adjacent to the existing levee.

Water erosion was rapidly eating away the old levees and within a short period of time impoundments with acreages totaling over 10,000 acres would be lost. The levees along the Humble Canal form one side of these impoundments.

A meeting was held with Union Producing Company, the oil company using the canal, and the Department of Public Works and a cost sharing plan devised for the repair work. Under this plan Union Producing Company was to replace the east levee and the La. Wild Life & Fisheries Commission the west levee. The Department of Public Works prepared plans and specifications for work.

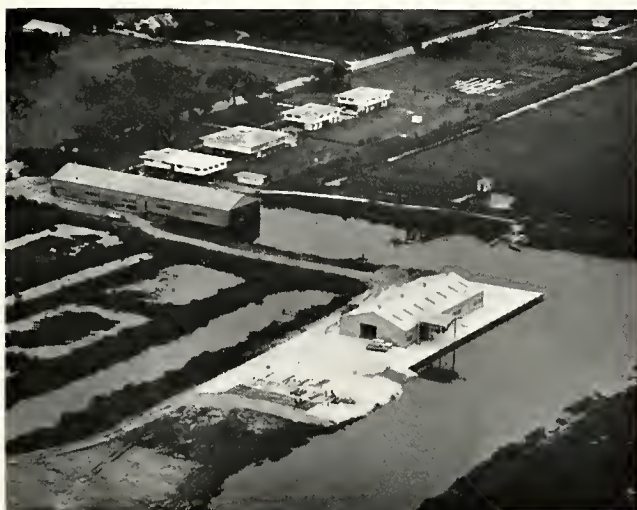
In June, 1964, Union Producing Company completed repair work on the east levee. All plans and specifications were completed on the west levee and bids were solicited during July, 1964.

A contract was issued for the levee work in August, 1964, and work begun shortly afterward. A new levee was placed along the west side of Humble Canal from the northeast corner of Lake 1 to the southeast corner of Lake 3. All phases of the levee work was completed in October, 1964.

All gated culverts leading from the impoundments to Humble Canal were blocked by the levees. Plans for new structures to provide water management within the impoundments are under study.

Pumping Units

From research projects on Rockefeller Refuge regarding water levels and water salinities as re-



Aerial view of the main headquarters' site of Rockefeller Refuge along with the storage shed, boat house, office and two residences for technical personnel working on the area.

lated to plant growth, it was obvious that without absolute water control, lean years were inevitable. Present management procedures on all impoundments are dependent on rainfall for a water supply. Several impoundments are drained in the spring each year to grow grasses and sedges for duck foods, then flooded in the fall to attract ducks. However, the presence of adequate rainfall at the proper time determines the success of this operation.

In order to provide more efficient management of the impoundment system on Rockefeller Refuge, a water pumping system is necessary. Pilot studies to determine the best techniques are presently underway and all materials and equipment have been purchased for installing a pump on one of the impoundments.

In 1963, a levee was placed across the South quarter of Lake 2 for the purpose of creating a dewatered goose area. The area encompasses 220-acres and has been fenced.

The Department of Public Works prepared plans and specifications for pumping facilities to dewater the area and in January, 1965, a contractor began installing a 24-inch pumping unit in the area. This work has been completed and the unit is now in service.

A 12-inch low lift pump was installed earlier on the north end of Lake 2 by refuge personnel and is currently used to dewater 100 acres as a goose pasture. The pump was set at an elevation of 5 feet above marsh level.

Boat Launching Ramp

Because of numerous airboats and outboards used in the refuge research, patrol and maintenance programs, a suitable launching ramp was necessary. In March, 1965, a concrete launching ramp, 20 feet wide, was constructed just west of the warehouse at the refuge headquarters. All work on the ramp was done by refuge personnel. The make-shift ramp used prior to this could not be used during low tides. Also, loading and unloading heavy boats was difficult and frequently resulted in equipment damage.

East End Garage

During the year, work was begun on a garage and storage room at the East End Camp on Rockefeller Refuge. An old boat house that had been removed from another area and stored at East End was modified and used as a garage. Shells were brought in to provide a foundation on which to set the building. The end of the building was closed off and a side entrance provided for two automobiles.

A partition was placed across one end of the building to provide storage.



Secretary of the Interior, Stewart L. Udall, was a guest of the La. Wild Life & Fisheries Commission, in May, 1964, and toured the marshes of Southwest Louisiana by seaplane with Richard K. Yancey, Assistant Director.



A road and bridge was constructed to a pumping plant installed in the 2,000 acre goose pasture at Rockefeller Refuge.

Goose Pastures

To facilitate the experimental work on Canada Geese on Rockefeller Refuge, additional goose pastures were constructed.

The Lake 2 area, lying southwest of the Main Headquarters, was fenced for the purpose of holding flightless Canadas. All phases of the fencing work were handled by the Department of Public Works and the project was completed in August, 1964.

The Lake 2 area now provides 1200 acres where the geese may range freely and is a valuable addition to the 140 acres originally fenced as a part of the Canada Goose Study.

In July, 1964, work began on a large holding pen for the captive flock of Canada geese. It is necessary to pen the geese for about four weeks each year when they molt their flight feathers and form new ones.

The pen was completed in August and measured 60 feet wide by 400 feet long having three sep-



A grain storage bin supplies feed for the captive flock of Canada geese, also for the birds in the waterfowl display pens, and various bait banding operations carried out on Rockefeller Refuge.

arate compartments. Also a corral 100 feet wide and 400 feet long was constructed at the site.

Refuge Office Addition

An office and laboratory building was constructed at the Rockefeller Refuge Headquarters after the original buildings were destroyed by Hurricane Audrey. This building had only one office and reception room and provided only enough room for refuge administration.



An extension was added to the office and laboratory building at Rockefeller to provide needed space for refuge administrative duties.



Wildlife technicians and supervisory personnel of the Arkansas Game and Fish Commission visited Rockefeller Refuge to review management work being done on the area.

The Research Section of the Refuge Division was stationed at the refuge and shared the office space. Temporary offices were set up in the laboratory.

Plans were made to provide additional office space and an architect was employed to prepare plans and specifications on the addition. After these were completed, the Division of Administration solicited bids and a contract was awarded the low bidder.

The contractor completed work on the office addition in October, 1965. The new building is an extension of the existing building and provides a reception room, five offices, a library and a map room.

Spillway—Lake 7

A spillway was constructed in the north levee of Lake 7 in March, 1964. The spillway was constructed with creosote treated piling and wales and interlocking steel sheet piling. The crest of the spillway was set 6 inches above marsh level and 20 feet wide.

The primary purpose of the spillway was to stabilize water levels in the 750 acre impoundment. The beach forms the south levee of Lake 7, and when storm tides flow over the beach, water is trapped in the area, often to a depth of 24 inches. When the tides drop, the water then trapped in Lake 7 washes back through the beach. A pipeline crossing in the beach was the weakest place and it was at this location that the water escaped permitting complete drainage of the impoundment. The spillway will provide an escape route for storm tides and maintain water levels at 6 inches. All work on the structure was performed by refuge personnel using refuge equipment.



A large equipment storage building, bulkhead and launching ramp was constructed at the main headquarters' site at Rockefeller Refuge.

Warehouse and Bulkhead

Final phases of a contract job to construct a warehouse and bulkhead on Rockefeller Refuge were completed in May, 1965. The final work included grading and shelling the site.

All design and construction supervision was handled by the Department of Public Works. A metal building 60 feet wide and 142 feet long was constructed and is equipped with 4 large sliding doors, 27 windows, 3 storage rooms, a 10 ton electric hoist and trolley and a fork lift truck.

Before the warehouse was constructed all refuge equipment and supplies were stored out-of-doors, which resulted in rapid deterioration. The warehouse now stores marsh buggies, dozer, tractors, implements, and materials and supplies such as lumber, pipe, plywood and fence wire.

A bulkhead 342 feet long was placed on the south and east side of the warehouse and constructed with inter-locking sheet piling with a concrete beam on top and tied back with 42-foot long steel piling. The bulkhead will not only prevent water erosion of the site around the warehouse, but also will provide docking space for mooring or loading refuge boats and barges.

A slip 500 feet long and 60 feet wide was excavated south and east of the warehouse to facilitate docking. Constructing the slip required the relaying of some 5,000 cubic yards of material from the site.

Roads and Bridges

Several additional roads were constructed and necessary maintenance was performed on existing roads on Rockefeller Refuge.

A bridge and roadway was constructed to the site of the pumping unit in the South portion of Lake 2 and a road was constructed to the pump in the North portion of Lake 2. A board road was constructed to the goose pen in Lake 2.

The 3-mile road to the Lake 14 Camp and East End Locks was re-shelled and graded. Also, weeds

and brush were cut periodically along the roadway.

Oil companies working on the refuge constructed several new roads to drilling sites and provided routine maintenance to existing roads and bridges. The use of roads to develop mineral leases has proven to be a very desirable wildlife management practice.

Protection Levee

A large spoil has been placed south of the new warehouse on Rockefeller Refuge. The new levee is 600 feet long, 60 feet wide, with a crest 8 feet above sea level. In the event of future hurricanes the levee will serve as a barrier to break the driving force of the wind and water. This will afford protection to the newly constructed building and its contents.

Bulkhead at Lake 14 Camp

The canal bank south and east of the Lake 14 Camp was gradually eroding away. Wave action brought on by wind and boat traffic cut the bank continuously, resulting in a gradual loss of the camp grounds.

In order to combat this loss, a bulkhead was placed along the canal bordering the east side of the camp grounds. The bulkhead is 50 feet long and constructed of creosoted-treated piling and sheet piling. The bulkhead will not only prevent erosion but also serves as a boat dock for refuge boats working out of this area.

Patrol Camps

The patrol camp on Rollover Bayou was completely remodeled by the refuge maintenance crew. The interior and exterior of the camp was repainted, all screens changed and the plumbing completed.

A tornado struck the Joseph Harbor Camp in July, 1965, and completely destroyed the building. The piling, braces and platform remained in place but the building was pulled from the foundation and turned over.

A small over-night camp was placed at Long Island on the refuge. The camp will house refuge wardens when working in that area.

Levee Repair

On Rockefeller Refuge over 150 miles of levee have been constructed. Many miles were simply spoil deposits from canals dug for access; however, many levees were built to form impoundments. Continuous levees when placed around a portion of marsh will hold water, then by regulating the water depth and salinity certain vegetation can be grown. By using this method of marsh

management, the refuge has been made very attractive to waterfowl.

Because of the fluid nature of marsh soils, all levees must be raised and reshaped after their



Refuge draglines work year round maintaining the 150 miles of levees which surround the many impoundments on Rockefeller and Marsh Island.



Research ponds have been constructed by use of a Refuge amphibious dragline to evaluate management practices for better production of wildlife food plants.

original construction. Also, certain levees must be raised periodically to offset subsidence.

During the period of this report refuge draglines have reshaped approximately 25 miles of levees on the area.

Water Control Structures

In February, 1964, a weir was constructed in Pidgeon Bayou on Rockefeller Refuge. The weir was built to stabilize water levels, salinities, reduce turbidity, reduce tidal action and improve the watershed for wildlife.

In construction creosote-treated piling and

interlocking steel sheet piling were used. The width of the bayou at the weir was 75 feet and wings extended out into the banks for 15 feet on each end of the weir. After completion of the weir 300 cu. yds. of oyster shells were placed on the structure to prevent erosion.

The crest of the weir was set 6 inches below marsh level. This elevation was established by an actual survey, since care is needed not to get the weir too high. The weir places 3,000 additional acres on the refuge under management.

In March, 1964, a weir was constructed on East Little Constance Bayou. The bayou was 60 feet wide at the point of the weir.

After completion of this structure, a number of persons owning property north of the refuge complained that the weir blocked the natural drainage of water from their marsh land. Several meetings were held discussing this structure, plus many others on the refuge.

In October, 1964, plans were made to remove the weir from East Little Constance Bayou and place small weirs in the tributaries leading into the bayou. This accomplished the same effect in improving the marsh for wildlife and kept the main channel open for drainage.

The material salvaged from the original weir was used to build small weirs in the tributaries. Seven small weirs in all were constructed in bayous ranging from 4 to 40 feet in width. Also, earthen dams were placed in several drainage ditches leading into the bayou.

The small weirs were completed in January, 1965, and brought under management approximately 2,200 acres of marsh land. This type of management has proven beneficial to wildlife and is being used by private landowners all along the Louisiana coast.

All phases of the work on the weirs were done by refuge personnel using refuge equipment.

Observation Towers

In order to facilitate patrol and protection of Rockefeller Refuge, two observation towers were built at strategic locations. The towers are primarily for use at night in spotting the lights of alligator hunters. Both towers are 30 feet high, constructed of creosote-treated material and provide coverage of about 10 square miles at night. Shelter from weather and insects will be provided on each tower to protect persons on lookout. Also, radios are provided for communication with ground units.

Equipment Maintenance

Maintenance and repair of refuge equipment and facilities constitute the major workload on

the refuge. Rockefeller is the most intensively managed wildlife refuge of its size in North America. Because of the magnitude of this operation numerous pieces of specialized equipment and various facilities are required.

Under salt water conditions such as those present on the refuge, everything deteriorates rapidly and maintenance is a continuous job. Also, the equipment used such as draglines, marsh buggies and boats are very costly to repair.

Equipment Garage

Plans were made to construct a 14-stall garage at the refuge headquarters, and in May, 1965, a concrete slab 40 feet wide and 70 feet long was poured for this purpose.

The building was erected in August, 1965, by the Refuge Division maintenance crew and was built to conform with other buildings at the refuge headquarters. Sliding doors were placed on each room so that the boats can be kept under lock when not in use. Facilities will be installed later for washing and cleaning boats and other pieces of equipment after use.

MARSH ISLAND WILDLIFE REFUGE

HARVEY H. LOURD
Refuge Supervisor

Water Control Structures

In keeping with the development program being carried out on Marsh Island Wildlife Refuge, the installation of the low sill weirs in the drainage systems has been one of the most successful management programs on that area. To date approximately 40,000 acres of marsh land have been improved for waterfowl with the installation of these structures. Prior to this development, Marsh Island was effected by daily tidal fluctuation, causing an unstable water condition in the ponds and the marsh. This prohibited the production of desirable waterfowl food plants. Also, an additional 9,000 acres of marsh land have been brought under management by the use of an impoundment system.

The crest of the weirs are set about 6 inches below marsh level, allowing high tides to flow over the structure but holding permanent water in the ponds and pot holes. These structures reduce water fluctuation, water turbidity, and stabilize water salinity. Also, beside benefitting waterfowl, these structures have greatly added to the shrimp production in the Vermilion Bay area.

During the past two years, three structures were built on Marsh Island bringing the total to 24 weirs. One weir has been constructed in Bayou Blanc. This weir is "V" shaped, and constructed

with steel interlocking sheet pilings. The weir is one hundred and thirty-five feet in length. In order to prevent erosion around these structures, oyster shells were placed on the ends of the weir and in the bayou adjacent to the weir.

In October, 1964, Hurricane Hilda hit the Louisiana coast bringing with it high winds, water and rain.

A break in the levee caused by Hurricane Hilda along Bird Island Bayou has been repaired by placing a small weir at this location. The crest of the weir was set 6 inches below marsh level. Wings were extended into the bank for 15 feet on each side of the weir. The ends of the weir and bayou bank were reinforced with native shell to retard erosion.

Plans have been formulated to construct ten water control structures in small bayous leading into Bayou Lucien, also five sites have been selected in small bayous leading into Bayou Michael using refuge personnel and equipment. All the necessary material for this project has been purchased and construction will begin as time permits.

During the past two years, refuge personnel made routine maintenance checks on the weirs on Marsh Island Refuge. Due to oil activity on Marsh Island, one weir off Bird Island Bayou was removed to facilitate boat traffic to this well location. When operations were terminated in this area, this weir was replaced by the oil company. Two weirs, located in Bayou Chene and Bayou Scat, were lengthened by adding steel interlocking sheet piling to these structures. This was done to prevent erosion around the structures. Also, erosion had begun around one weir in Oyster Bayou. In order to prevent this erosion



The use of roads to develop the various mineral leases on Marsh Island Refuge will prove to be beneficial to wildlife as compared to flotation canals which created a constant erosion problem.



Roads have proven to be a very desirable approach to the development of mineral leases on the Rockefeller and Marsh Island Refuges.



Wakefield type weirs in the drainage system reduces daily tidal fluctuations and stabilize water levels in the marsh and ponds behind the structures.



Dr. Orville Brim & Dr. Oscar Ruebhauser, officials of the Russell-Sage Foundation visited Marsh Island during 1966. A complete tour of the area was made by airplane and boat.



The construction of low sill dams have proven to be beneficial in improving habitat for wildlife on Marsh Island Refuge as well as providing many hours of recreation for sportsmen.

a barge load of shell was placed around the ends of this weir. The remaining structures were found to be in good shape and not in any need of repair.

Boat Maintenance

Because of the shallow water and numerous oyster reefs, boat maintenance is a continuous problem. It has been necessary to replace wheels, struts, and rudders often. All minor repairs were accomplished on the refuge and all major repairs were sent to the wharf in New Orleans. During this biennial period, the inboards were hauled out annually, scraped and completely repainted.

Headquarters and Patrol Camps

The main camp which is located on Bird Island Bayou, boat house and patrol camps received damages from Hurricane Hilda in October, 1964. Since that time the main building at Marsh Island Refuge received a new coat of paint, both inside and out, also all rotten and broken screens were replaced. New furnishings were placed in all the bedrooms and the living area. The small patrol camp located near the impoundment levee was completely destroyed by Hurricane Hilda. The boat shed received extensive roof damage and the Mound Point camp received minor damage from this hurricane. Several house trailers, which were used as overnight patrol camps, were completely destroyed.

All refuge property was insured and full compensation was received for the losses. A small patrol camp located near the impoundment levee has been built to replace the camp destroyed by Hurricane Hilda.

Airplane Strip

A small landing strip is now being constructed for light aircraft on the east side of Bird Island Bayou near the refuge headquarters. This strip will facilitate management of the area by refuge personnel. After completion, it will be approximately 1500 feet long and 200 feet wide. This work is being done by refuge personnel and equipment.

Wood Duck Pen

A wood duck pen has been constructed on the lawn of the main headquarters of Marsh Island Refuge, and ten pair of wood ducks have been transferred from the captive flock on Rockefeller Refuge to this new pen. These birds will serve as a nucleus for nesting wood duck population on Marsh Island. A portion of this pen was destroyed by "Hilda" and part of the captive flock of wood duck escaped. The pen has been repaired and these birds will be replaced from the captive flock on Rockefeller Refuge.

Patrol Towers

Because of Marsh Island's unique location, complete protection from poachers is a very difficult task. Due to large concentrations of blue and snow geese on the refuge during winter months, a constant patrol must be maintained. As the weather conditions warm in the spring, alligators become more active. Due to the high market value of these skins, constant night patrols during the spring and summer months are necessary in order to protect these animals from illegal hunting. To facilitate this patrol work, two towers were constructed at strategic points on Marsh Island. The towers are 35 feet and 65 feet from the marsh floor. They were constructed of creosote timber pilings, and cross boarded with 2 x 6's.

Marsh Burning

A burning program is conducted on Marsh Island Refuge each year. This program begins in the fall and continues until March, depending upon weather conditions. Since the disappearance of the three-square, the desired blue and snow goose food, dense stands of coarse wiregrass and black rush have invaded this area. The annual burning program removes this coarse vegetation and encourages the growth of better game food plants. Approximately 60 per cent of the refuge has been burned each year. Blue and snow geese will invade a fresh burn and stay concentrated in this area until they have consumed all the desirable food plants in the burn. Then another burn is made and the geese are thus attracted to this new area. This process is repeated until the northward migration begins.



Hurricane Hilda struck the Louisiana Coast in October 1964. The main camp located on Bird Island Bayou received extensive damages from this hurricane. All refuge property was insured and full compensation was made for the losses.



Complete protection of the alligator population on Marsh Island is a very difficult task. Pictured above are some of the equipment seized by refuge wardens and Commission personnel from alligator poachers.



H. H. Lourde, Supervisor of Marsh Island Refuge, carefully inspects a control burn. These burns are made annually to encourage desirable waterfowl food plants.



With careful burning practices, thousands of blue and snow geese are lured to Marsh Island each year.

Live Oak Plantings

Well formed beaches along the Louisiana coast protect adjacent marshes from storm tides and erosion. Likewise, a suitable vegetative cover protects the beaches from storm tides and erosion.

In order to accelerate the establishment of such vegetative cover, a process which will take nature many years, the La. Wild Life & Fisheries Commission recently began a tree planting operation on the Marsh Island Refuge. The area to be planned is the relatively stable beaches on the southwestern portion of the refuge



Personnel from the U. S. Fish & Wildlife Service visited Louisiana's marshes in order to get a first hand picture of our waterfowl situation. Shown above are Richard K. Yancey, Asst. Director, La. Wild Life & Fisheries Commission, John S. Gottschalk, Director, U. S. Fish & Wildlife Service, Preston E. Davis, Chief Pilot, La. Wild Life & Fisheries Commission, and Walter A. Gresh, Regional Director, U. S. Fish & Wildlife Service.

The live oak has been selected for planting on the beaches. Acorns were collected from areas near Marsh Island, germinated, potted and transported to the refuge for planting.

The live oak is not presently found on Marsh Island; however, nearby beaches such as Cheniere au Tigre and Mulberry Island have dense forests of live oaks. In these areas the live oaks serve to protect the beaches, and in turn the beaches protect the marches from storms. Also, the live oaks make a great contribution to wild animals which inhabit the sea rim.

Considerable assistance in this project has been given by the Pullen Moulded Products Company of New Iberia. After seedlings have reached planting size at this nursery, refuge personnel pick them up and transport them to Marsh Island for planting.

PASS-A-LOUTRE WATERFOWL MANAGEMENT AREA

ELLIS W. LOGA
Supervisor

TED JOANEN
Biologist

The 66,000 acre Pass-a-Loutre Waterfowl Management Area located at the mouth of the Mississippi River provides some of the finest duck hunting this state has to offer. This tract of land was set up in 1921 by an Act of the Legislature as a public shooting area and is located at the extreme end of the Mississippi Flyway in Plaquemines Parish. Each year during the high river stages as the Mississippi River flows over its banks, it deposits tons of top soil carried from the central United States. This material is dropped in the marsh ponds as the water slows down



The main camp located on Dennis Pass serves as a base station for Commission personnel while working on the area. Also, all the equipment from the public camps are stored in a warehouse here at the conclusion of each waterfowl season.

and creates ideal conditions for the production of desirable waterfowl food plants.

In September, 1965, Hurricane Betsy struck the Louisiana coast bringing winds estimated up to 167 miles per hour. Three public hunting camps were lost along with numerous hunting boats, mattresses and other hunting gear from the main headquarters area. In spite of the five to six foot tides experienced on the lower delta, the marsh conditions were in relatively good shape and played host to thousands of waterfowl during the past season. Many of the important waterfowl food plants such as delta duck potato and fresh water three-square had matured prior to the hurricane and were available to wintering waterfowl. In many areas large stands of aquatics were protected by extensive stands of roseau cane (*Phragmites communis*).

During the cleanup period following the hurricane, our main headquarters facilities served as a base station for Commission personnel while aiding in evacuation, rescue, and other emergency tasks in the Venice and Pilottown areas. Also, the Commission owned tub boat Brant helped in removing the tremendous amount of debris, dead cattle, wildlife and sunken boats from the key docks in the Venice area. This heavy equipment also worked on levees that would hasten drainage of that area.

In 1954 the Louisiana Wild Life and Fisheries Commission initiated a public waterfowl hunting program on the Pass-a-Loutre area and nine hunting camps were constructed to provide overnight facilities. These camps were strategically located through the central portion of the area and occupied some 20,000 acres of ideal hunting grounds. The use of these camps is restricted to duck hunters who make application to the Commission and are selected by drawings. A fee of \$5.00 for a two-day hunt is charged each hunter. In exchange for this nominal cost the Louisiana Wild Life and Fisheries Commission provides transportation from Venice, Louisiana to Pass-a-Loutre and return. At Pass-a-Loutre a camp, cooking utensils, beds, decoys, duck boats, butane and a two-day hunt on one of the

finest duck hunting marshes is provided. In addition to the portion of Pass-a-Loutre reserved for the public camps, the remainder of the area is opened to hunters who wish to make a hunt using their personal equipment and facilities.



Commission owned tug, draglines and barges assisted in cleaning up residential areas in Venice, La., following the destructive Hurricane Betsy in September, 1965.



A short briefing session before each hunt at Pass-a-Loutre takes place at the Texaco dock in Venice, La. General waterfowl regulations, camp rules and hunter safety are stressed.



Commission owned boats Tarpon and Pintail underway with a full complement of public camp hunters.

Free permits are issued for the use of this area and are valid for the entire waterfowl season. Duck hunting on this portion of the area is equally as good as the area reserved for the camps and use of this area has increased tremendously. A portion of this open area lying west of South Pass has been opened for afternoon shooting to take advantage of the blue and snow geese which utilize this portion of Pass-a-Loutre. On the remainder of Pass-a-Loutre morning shooting only is permitted in order to hold the large body of ducks which utilize this area and provide choice waterfowl shooting throughout the season. During the forty-day duck season of 1964-65, a total of 792 permits were issued for use of our camps. Of this, 679 hunters made the trip and killed 2,933 ducks for an average of 2.16 per hunting effort. Crippled by Hurricane Betsy, the Louisiana Wild Life and Fisheries Commission operated six out of the nine public camps during the 1965-66 waterfowl season. A total of 492 permits were issued with 437 hunters making the trip and killing 2,058 ducks for an average of 2.36 per hunting effort. The number of hunters, fees charged and the money derived from the present shooting program since its initiation in 1954 are shown in Table 1. Also, in 1964-65, 833 permits were issued for the open areas lying west of South Pass, Southeast Pass and Pass-a-Loutre. During the 1965-66 waterfowl season, 481 permits were issued.

Table 1

<i>Waterfowl Season</i>	<i>Number of Permits</i>	<i>Fee</i>	<i>Money Derived</i>
1954-55	576	\$ 2.00	\$1,152.00
1955-56	1,523	2.00	3,046.00
1956-57	660	10.00	6,600.00
1957-58	569	10.00	5,690.00
1958-59	1,143	5.00	5,715.00
1959-60	648	5.00	3,240.00
1960-61	618	5.00	3,090.00
1961-62	326	5.00	1,630.00
1962-63	327	5.00	1,635.00
1963-64	591	5.00	2,955.00
1964-65	792	5.00	3,960.00
1965-66	492	5.00	2,460.00



A system of ditches have been cut behind each public camp to facilitate access routes to choice hunting grounds during periods of low tide.

Development

Management of the Pass-a-Loutre area is relatively simple as compared to the other marsh areas under management by the Refuge Division because of the annual deposits of silt as mentioned above. It is from the high river stages that the entire delta complex is maintained. In many portions of Pass-a-Loutre as much as four inches of fertile silt is deposited annually. Extensive stands of delta duck potato and fresh water three-square are produced as a result of this deposit and the normal manipulations of water levels. Several small earthen plugs and levees have been constructed on the area to favor the establishment of stands of desirable food plants by use of the refuge dragline.

The development of the various mineral leases on Pass-a-Loutre has continued to be a problem of growing magnitude and one which requires continuous vigilance by refuge personnel. All of the drilling sites must be reached through excavation of access canals. Being a floating marsh area, levees will not stand up and thus the problem of drainage and salt water intrusion is created at each new drilling site.

Research

During the past two years biologists of the Commission have collected extensive waterfowl kill data at the public camps on Pass-a-Loutre. This information along with research data collected throughout the state forms the basis from which the Louisiana Wild Life and Fisheries Commission tries to secure a more realistic waterfowl season for the Louisiana duck hunters. A definite increase of hunter interest was indicated during the 1965-66 season. The total kill of waterfowl by hunters participating in the public camps for the 1964-65 and 1965-66 seasons is presented in Table 2.



The Lower Delta of Pass-a-Loutre provides some of the finest duck hunting in the Mississippi Flyway. Each year it plays host to duck hunters from all parts of Louisiana.

Table 2.

**WATERFOWL KILL BY SPECIES FOR THE
PUBLIC SHOOTING AREA, 1964-65 AND 1965-66**

Species	*1964-65 40 days 4 duck bag	**1965-66 40 days 4 duck bag
Mallard	111	67
Gadwall	1,347	1,197
Baldpate	308	120
Green-winged Teal	161	148
Blue-winged Teal	194	121
Shoveler	184	58
Pintail	276	100
Mottled	111	23
Redhead		3
Canvasback	34	41
Lesser Scaup	131	142
Ring-necked Duck	69	27
Merganser	3	9
Others	4	2
TOTAL DUCKS	2,933	2,058
Blue Geese	2	52
Snow Geese		
Canada Geese	CLOSED SEASON	
TOTAL GEESE	2	52
Coots	288	118

*9 camps operating
**6 camps operating

Detailed ecological studies on the delta duck potato and fern water 3-square were carried out on Pass-a-Loutre by biologists of the Refuge Division and Dr. Leslie L. Glasgow of Louisiana State University. Efforts were directed toward determining the factors that affect plant growth, seed and tuber production. Small plots were established and seed and tuber production sampled periodically. Exclosures were built to exclude nutria, hogs and ducks and to measure the utilization on these plant species by ducks, geese, hogs and nutria. Management practices, the end result of research, are now being directed to the production of these plants on the lower delta.

During the past two years 325 deer were captured by the Louisiana Wild Life and Fisheries Commission for restocking purposes. These deer were removed from the Delta National Wildlife Refuge at the mouth of the Mississippi River. In 1965 a total of 175 deer were captured from the the marshes of the Delta Refuge in some 7 hours of operating time.

A light spotter aircraft working in conjunction with fast radio equipped airboats were the principle tools that made this project such a success. In setting up this operation, an aerial inventory of the deer herd at the mouth of the Mississippi River was conducted by the Commission. It was estimated at that time that over 600 deer were present on the Delta Refuge. Following conferences with Mr. Walter Gresh, Regional Director of the Bureau of Sport Fisheries and Wildlife, and Mr. John Novak, Refuge manager, the Bureau issued the Louisiana Wild Life and Fisheries Commission a permit to remove, for

restocking purposes, approximately 30 per cent of the deer herd from the federal refuge. After receiving the permit the Commission then assembled its personnel, 2 light aircraft, 4 airboats, trucks, hauling crates and a Commission owned tug boat and barge to transport the deer from the Delta up the Mississippi River to Venice.

The very conditions that make the Delta marshes the most difficult in the state to work in normally were perfect for this job. Mississippi River water levels were up and substantial portions of the deer habitat were slightly flooded making it fairly easy for the airboats to travel. This same condition created difficult escape conditions for the deer. As each deer was driven from a dry section of a floating marsh it was quickly captured in the soft marsh muck or water, tied up and loaded on one of the airboats within three or four minutes.

The deer were then pushed up river to Venice by the Commission tugboat where they were dispatched by truck to various release sites. This concluded without incident the most successful trapping operation carried out by the Commission.

Removal of the 175 deer from the Delta Refuge will prove advantageous not only to the areas where the transplants were made but also the deer range and the herd on the Delta. Annual thinning of the herd will reduce heavy browsing pressure on the marshes and leave more food for remaining deer. Not only will this greatly alleviate the danger of die-offs at the Delta from starvation resulting from over population, but it will leave the remaining deer in good physical condition. Healthy deer will then in turn produce more young that can be used for transplanting purposes in the future. This is extremely important now following Hurricane Betsy which caused some severe short-termed damage to the Delta deer habitat.



Refuge airboats were used to capture white-tailed deer for re-stocking purposes.



Biologists have collected intensive waterfowl kill data for the past ten seasons at the public camps on Pass-a-Loutre. This information has been used by the Commission in many of its arguments to receive a more realistic waterfowl season for Louisiana duck hunters.

The Delta deer were released under the long standing Commission policy of stocking deer only in ranges of suitable quality where no deer were present and where deer hunting seasons would remain closed for a period of five years or until such time as populations increased to a huntable size.

The transplanting program carried out in Louisiana during the past 15 years has been extremely successful and deer herds have already increased to huntable numbers over about 85 per cent of the deer range in the state.

It has been necessary to confine the taking of fur bearers on Pass-a-Loutre to begin after the waterfowl season. This has been done so no conflict will arise between our public camp hunting program and the trapping program. All trappers were required to obtain a permit and to report their daily catch at our main headquarters facility on Dennis Pass. During the 1964-65 season approximately 8,000 nutria were taken. A agreement has been made with the trappers to reimburse the Louisiana Wild Life & Fisheries Commission at a rate of 10 per cent on all fur bearers taken during the 1965-66 trapping season.



Water pumps have been installed at each public camp. Improvements such as this add to the hunters' comfort and convenience.

Maintenance

Continuous maintenance work has been necessary at the main headquarters site in order to keep these buildings and wharves in good condition. Due to the recent hurricane in September, 1965, the main headquarters area, including the main camp, storage sheds, boat houses, wharves and patrol boats received extensive damage. All refuge property was insured and full compensation was received for the losses. The yard and airstrip, covered with flood tides, have been replanted and a good cover of grass has been established. Also, the access canal in the rear of the camp was dredged.

The powerlines which supply electricity to the main camp from the Freeport Sulphur Company were broken in many places and some poles were broken off at ground level. Electricity has since been reestablished through these lines and each pole was straightened and extra supports and guide lines were attached by the Refuge Division maintenance crew. Also, a new gas line was installed by the Texas Company to service the main headquarters facilities. As a result of the hurricane, three public hunting camps were destroyed and the remaining six camps received extensive damage. These six camps were cleaned inside and out and received a new coat of paint. Decoys, push poles, paddles, life preservers and various utensils and supplies were stored at the warehouse at the conclusion of each waterfowl season. This warehouse was destroyed by high waters and winds. As a result, this equipment was scattered in the marsh north of the area. The majority of this equipment was retrieved, cleaned, and re-stored in good shape.

The patrol boats Sprig and Skimmer required maintenance as a result of the hurricane. These boats were sent to the Commission wharf in New Orleans and the necessary repairs were made. Numerous outboard motors were also damaged. Minor repairs on these engines were completed on the refuge and major repairs were done at the Commission wharf in New Orleans.

STATE WILDLIFE REFUGE

HAMPTON GREEN
Refuge Supervisor

Water Control Structures

Three weirs have been constructed on State Wildlife Refuge during the past two years. The locations are in North Bayou, Prien Bayou and Hog Bayou. The structures were constructed with steel sheet piling and creosote timber piling. The ends of the weirs and bayou banks were reinforced with native shell to retard erosion. All work was done by refuge personnel using refuge equipment.

The North Bayou weir is located 300 feet north-east of the Main Camp on State Wildlife Refuge. The bayou at this point is 70 feet wide. This structure has brought water control to approximately 1,000 acres.

The Prien Bayou structure was constructed about 1,000 feet west of Vermilion Bay. Prien Bayou at this point is 35 feet wide, and also places about 1,000 acres under management. The Hog Bayou weir was constructed 1,200 feet west of Vermilion Bay. Hog Bayou is 85 feet wide at this point and controls about 1,800 acres of marsh.

As a result of Hurricane Hilda in October, 1964, these 3 structures received extensive damage. High tides had washed around and beneath these structures, also the weirs were weakened by a build up of tides caused by the hurricane.

Plans were formulated and repairs were made to the existing structures, also several new sites have been selected for water control structures. The potential sites are in Toms Bayou and in a tributary bayou leading into Lake Fearman. Also, a small bayou located on Redfish Point and part of the north bayou weir complex will be plugged with an earthen dam. With the installation of these structures approximately 6,000 acres will be effected.

Headquarters

The main camp at State Wildlife Refuge has undergone considerable remodeling and repair during the past two years. The exterior of the main camp was cleaned and repainted and all rotten screens were replaced.

Two house trailers were purchased and stored at the refuge headquarters. Damage from Hurricane Hilda was extensive on State Wildlife Refuge. One house trailer was completely destroyed while the other received only minor damages. All refuge property was insured and full compensation was received for the losses.

Formally no facilities were available for docking seaplanes near the main camp. A landing

dock has been constructed in order to facilitate seaplane docking near the refuge headquarters.

Large piling were driven in Vermilion Bay to serve as a channel marker to Bayou Fearman. Due to the shallow water surrounding State Wildlife Refuge, these markers will facilitate access to and from the main camp at State Wildlife Refuge.

Boat Maintenance

Routine maintenance was done on all equipment as required. The Ostria was set to the Commission wharf in New Orleans and the hull was completely renovated, also a new engine was put in the boat. The Lafitte skiff was repainted and the wheels were changed on both boats. The aluminum barge and outboard hulls were scrapped and painted. Major repairs on all boats are done at the Commission wharf in New Orleans.

Airstrip

In April a dragline was brought to the refuge to lengthen the airstrip. The completed job brought the total length of the airstrip to 1,500 feet. A bulldozer was used to level the recently added portion of the strip. The entire 1,500 feet are serviceable for light aircraft.

Boat House, Work Shop and Patrol Camps

The workshop, tractor shed, and tractor on State Wildlife Refuge were destroyed by fire in March, 1963. All refuge property was insured and full compensation was received for the losses.

A utility storage shed has been constructed by refuge personnel on the headquarters' site. Also, a boat house has been constructed by refuge personnel. A barge load of native shell has been placed around these new installations.

Plans to construct a patrol camp on Hog Bayou as a replacement for the camp lost in the hurricane have recently been completed. This camp will be constructed on timber pilings and located by the Hog Bayou weir.

COULEE WILDLIFE REFUGE

Coulee Wildlife Refuge is located in the southern portion of Morehouse Parish and is a privately owned 3,000 acre tract of hardwood bottom land which has been made available to the Louisiana Wild Life and Fisheries for many years as a wildlife refuge. The two basins on Coulee provide resting sites for some 30,000 ducks each winter which spend the days on Coulee and move into Wham Brake each afternoon to feed. This area has played an important role in providing good waterfowl shooting in the Monroe section of Louisiana.

REFUGE DIVISION RESEARCH

ROBERT H. CHABRECK

Research Leader

TED JOANEN

Biologist

HOWARD H. DUPIUE

Biologist



The basins on Coulee Refuge annually winter 20 to 30 thousand ducks. This area provides not only a small feeding area, but also a resting area and contributes to holding large concentrations of waterfowl throughout the entire duck season in the Monroe area.

Maintenance work consisted of routine patrol trips by agents of the Enforcement Division and the manipulation of the water control structures to obtain desired water depths in the two basins.

During the summer of 1965 an aerial planting of brown top millet was made in the lower basin and fair germination was obtained. A power company installed a high voltage transmission line across the basin necessitating drainage of this area which made an ideal condition for the brown top planting.

A lease was renewed for a ten year period on the eastern half of the refuge during 1965, and an effort will be made to continue the lease on the western portion of the area on an annual basis.

ST. TAMMANY WILDLIFE REFUGE

JOSEPH M. DIRMANN

Supervisor

Shoreline erosion on Lake Pontchartrain has continued to cut into the St. Tammany Wildlife Refuge. This area is composed of some 1300 acres of beach front and marsh land and varies in width from some hundred feet to about one quarter mile wide along the northwest shore of Lake Pontchartrain in St. Tammany Parish.

The marsh ponds provide excellent habitat for a large number of ducks and a small number of muskrat have reproduced in this area during the past two years. Due to the small size of the refuge an overflow from the muskrat production has provided some trapping on adjacent marshes.

Research of the Refuge Division was conducted by technical personnel under a research section. Research projects were conducted on all refuge areas with objectives designed to investigate and evaluate various management practices for both marsh wildlife and plants. With this information definite plans are formulated which serve as a guide for developing and operating the refuges for wildlife. The results of these various studies and management practices not only serve to improve the refuge areas for wildlife, but also serve as a guide for private landowners interested in marsh management for wildlife.

Several studies were carried out on Rockefeller Refuge in cooperation with the Louisiana Cooperative Wildlife Research Unit, the Louisiana Cooperative Fishery Research Unit and Louisiana State University. Short-termed studies were set up but each was aimed at investigating important wildlife problems.

Progress reports on all refuge research were placed on file with the Louisiana Wild Life and Fisheries Commission. Final reports were published in journals or circulars with international distribution.

Studies on animals and animal populations and the factors influencing plants and plant growth will be continued. The status of various studies now in effect with a listing of the study purposes and results follow under separate headings.

Impoundment Surveys

Each impoundment on Rockefeller Refuge is sampled annually to determine the plants growing in the impoundment and the distribution of the various species present. Also, adjacent unmanaged marsh is sampled for use as a control area. Sampling is done in September each year.

Monthly records are kept on water levels and water salinities in the impoundments and control areas. The data on water conditions, when compared with the vegetation present, provide valuable information for managing each unit.

The primary objective of this study was to determine the ecological changes in vegetation in the ten Rockefeller Refuge impoundments and to relate these changes to annual climatic and edaphic factors.

During September, 1964, the vegetation in each impoundment and adjacent control areas was sampled using line transects. Also, monthly checks were made of water levels and salinities

in all impoundments and control areas during 1964. Data on rainfall was gathered with a rain gauge at the Main Headquarters area on the refuge.

Rainfall during 1964 on Rockefeller Refuge was about normal and 49.70 inches were recorded for the year. This broke the drought which had extended through 1962 and 1963. However, drought conditions prevailed again in 1965 and 41.62 inches of rainfall was recorded at the Rockefeller Refuge Headquarters.

The driest period in 1964 was during the spring and this was advantageous since it permitted annual grasses to germinate on the exposed soil. The 1964 rainfall was 10 inches over 1963 and 15 inches over that recorded in 1962.

Water levels in both the impoundments and control areas followed the general pattern of previous years. Water depths began decreasing in February and reached its lowest for the year in June. Then over 11 inches of rain fell in July bringing water levels up. Intermittent showers after this kept water levels up for the remainder of the year.

Water salinities increased as water depths decreased, reaching their highest point in June. Heavy rains in July brought salinities down considerably.

Hurricane Hilda in October, 1964, struck the Louisiana coast just east of Marsh Island. However, water levels and salinities showed no change as a result of the storm. Likewise, Betsy struck the New Orleans area in September, 1965, and no effects of the storm were shown on the Rockefeller Refuge.

Little difference was noted in the vegetation coverage of the impoundments and control areas. Also, the coverage of these areas in 1964 varied only slightly from 1963.

With the heavy summer rains in 1964 annual grasses and *Sesuvium* failed to show up in 1964 as during several previous years. However, during 1964 *Eleocharis* made good growth and filled the vacancy thus created.

Spartina patens was a dominant in both the impoundments and control areas in 1964 and 1965. In the impoundments, *Eleocharis* made big increases over the previous year, while *Sesvium* made a drastic decrease. This change is directly related to water levels. In the impoundments *Eleocharis*, *Leptochloa* and *Ruppia* were major duck foods. However, practically all impoundments produced an abundance of duck food, but some species made up only a small percentage of the composition.

In the control area it appears that *Distichlis* increased; however, this change probably resulted from new areas sampled south of Price Lake near the beach, which has a high percentage of *Distichlis*. Major duck foods in the control areas were *Eleocharis* and *Ruppia*.



Data compiled by biologists of the Refuge Division through various research projects are made available to private landowners throughout the state.

Scaup Banding

What are the migration routes for Louisiana ducks, how long do they live, how many are killed each year? These are questions frequently asked. The answers are not only of great interest to sportsmen but vitally important to persons responsible for managing our wildlife resources.

MONTHLY RAINFALL

	1964	1965
January	5.81	1.60
February	2.92	3.79
March	3.71	2.43
April	1.05	0.32
May	1.48	4.52
June	3.22	5.51
July	11.18	2.32
August	4.78	6.59
September	3.60	4.15
October	2.10	1.01
November	4.90	2.15
December	4.91	7.23
TOTAL	49.66	41.62

For many years the Louisiana Wild Life and Fisheries Commission has been seeking answers to these and many more questions regarding Louisiana wildlife. The answers do not come overnight. Rather, many years of planning, field work and analyses are required.

One such study involving the banding of 4,969 lesser scaup has been underway on Rockefeller Refuge in Southwestern Louisiana since early 1960. This study was designed to provide information on the duck now wintering in Louisiana in greatest numbers—the lesser scaup.

The lesser scaup has several aliases: Dos gris, blue bill, blackjack, and since 1963, bonus duck. The scaup has increased in recent years and wintering populations in Louisiana now number about 1.5 million. They arrive in October, depart

in May and are distributed in all parts of the state, but largest concentrations are found along the coast. Large flocks have been seen in the Gulf as far out as 25 miles, apparently unaffected by heavy seas.

A banding program was started on Rockefeller Refuge in January, 1960. The first part of this program was instituted as a pilot study, set up to develop ways and means of live-trapping large numbers of birds under the conditions as found on the refuge.

The 1960 banding program was terminated with the beginning of the northward migration. A total of 588 scaup were banded during the spring.

An expanded banding program was planned for 1961. Large concentrations of scaup were located in the Gulf off Rockefeller Refuge during early winter. Normally the scaup move inland in January or February and we had everything set up for their arrival inland. However, the scaup had different plans and remained offshore until the time for migration. As a result, no scaup were banded that spring.

In 1963 the scaup moved inland on schedule. The method developed in 1960, with slight modification, was used and by mid-April, 1,270 scaup departed northward from the refuge carrying new bands.

In 1964 an expanded program was planned and again the scaup moved inland in large numbers.



During the past two years over 5,000 ducks were banded on Rockefeller Refuge. The information received from the return of bands supplies the knowledge to better manage the waterfowl populations.

Trapping was begun in mid-January and by mid-April 3,111 scaup were banded.

In the course of the 1964 trapping, 27 scaup were recaptured that were banded the previous year on Rockefeller Refuge, and 7 that had been banded in 1960. In addition, 10 scaup were captured carrying bands installed elsewhere.

Since the beginning of the banding program, 27 recoveries were reported on scaup banded on the refuge. Of these, 23 were killed and turned in by hunters.

National recovery records show that eleven of the birds were killed in Gulf Coast states, 4 in Midwest, 5 in Canada and 1 in Alaska. The scaup recovered in Alaska was live-trapped and released during a banding operation similar to the one on Rockefeller Refuge.

Scaup banded on Rockefeller Refuge during the spring showed a fairly wide distribution across the Gulf Coast on their return trip the following fall. Banded birds were recovered from South Texas across Louisiana to the Western part of Mississippi. Over half of the recoveries from Louisiana were from the southeastern part of the state.

Canada Goose Study

Although the Louisiana marshes and prairie provide thousands of acres of ideal Canada Goose nesting habitat, this species does not normally nest here. Also, the gradual trend toward dewatering the marshes for cattle grazing has increased the potential goose nesting habitat.

At one time Louisiana wintered approximately 100,000 wild "honkers," but this number gradually declined until today only 5,000 winter in the state. The decline in the wintering population has been attributed to special goose management farther north in Missouri, Illinois and Tennessee which has resulted in the Canadas being short-stopped.

If Louisiana is to again have Canada Geese, nesting birds must be established in the state such as the Mottled Duck. A study was set up on Rockefeller Refuge and the primary objectives were:

1. To obtain suitable Canada Goose breeding stock.
2. To determine the factors associated with pair formation and nesting in Louisiana.
3. To determine the care needed by both adult and immature geese.
4. To determine if the young produced in Louisiana will remain here to nest if permitted to fly.

In November, 1963, 1,500 Canadas were transported by Commission truck from the Swan Lake National Wildlife Refuge in Missouri. The geese were banded, wing-clipped and released in a 120-acre pasture on Rockefeller Refuge. None nested

in the spring, 1964, so all were moved to a 1200-acre pasture. Then in the spring, 1965, none nested again. In the summer, 1965, 700 of the Missouri birds were permitted to fly and the remainder were to be held over through the 1966 nesting season.

Nesting remained quite active among the Wisconsin Canadas in 1964 and 1965. In 1964 of 5 nesting attempts, 20 young were produced. In 1965 from 21 nesting attempts, 19 young were raised.

The 21 nesting attempts reflect numerous nesting attempts. Predators, mainly racoons and opossums, concentrated in the nesting area in 1965 destroyed many nests and eggs. A control program was initiated but the damage had been done.

In 1965 a total of 96 eggs were laid as compared to 25 for 1964. The number of eggs per nest was about the same for each year for complete clutches.

Several encouraging facts were noted during 1965. One of the young hatched on the refuge in 1961 nested during 1965. Also, a Canada fully winged and able to fly nested during 1965.

Alligator Movement Study

The alligator is a very important member of Louisiana's wetland fauna. This species is found in practically all portions of the state but, because of indiscriminate killing of the animals, large numbers are found only on areas providing rigid protection. The high value of alligator skins, coupled with the animals vulnerability to hunting, has been the primary cause of the heavy kills.

In an effort to rebuild the state's alligator population, the 1960 Louisiana Legislature established a size limit and maximum season length on alligators and gave the Louisiana Wild Life and Fisheries Commission authority to set the season. In 1963 the season was closed statewide, and enforcement efforts increased in order to reduce the kill.

Because of the high value of alligators, landowners along the Louisiana Coast have expressed keen interest in rebuilding alligator populations. However, only general management procedures are known for the Louisiana marshes. Protection has been the main tool of managing alligator populations in recent years mainly because little information has been available on other aspects of management such as habitat manipulation, selective harvesting, the effects of restocking and so forth.

In order to obtain information useful in managing the species, a study was begun on Rockefeller Refuge in 1959. The study was later expanded to include other areas in the state.

A knowledge of alligator movement and the factors effecting movement is important in habitat management, partially where an area is managed for more than one species such as alligators and ducks. Also, this information is very valuable in planning an alligator restocking program. Likewise, in planning a harvest operation alligators can be selectively harvested when the movement habits of a particular area are known.

From 1959 through 1965, 2,024 alligators were captured, marked and released in Southwestern Louisiana. Of these 131, or 6.47 per cent, were recovered or recaptured. The alligators were captured on Rockefeller Wildlife Refuge and Sabine National Wildlife Refuge. The data from tagged animals plus numerous observations on the refuges provided information for this study.

Movement was greater among immature alligators (less than 6 feet long) than adults. However, no difference was noted in the movement of tagged immature alligators from 2 to 6 feet long.

Tagged alligators captured and released at the same time moved farther and farther from the site as time progressed. Of those recaptured after 3 years, 67 per cent dispersed over one mile from the release site.

The factors listed as having an effect on natural movement were temperature changes, the breeding season, high water conditions, drought, food supply and water salinity.

Tagged alligators transported elsewhere for release moved 3 to 4 times greater than normal and showed strong homing instincts. Of those recaptured 2 years or more after release, 83 per cent had dispersed 8 miles or more from the release site.

Alligator Growth Study

From 1960 to 1965, 2,024 alligators were tagged and released as part of the Rockefeller Refuge Research on the reptiles. During that period 131 or 6.47 per cent were recaptured thus providing valuable information on the growth of the animals between the time of release until the time of recapture.

Also studies are currently underway to develop techniques for aging alligators by cross-sectioning certain leg bones. Preliminary studies on the technique reveal growth rings similar to those on trees can be correlated to the age of the animal.

The data on growth shows that a newly hatched alligator is 8 inches long. In a year's time, they have more than doubled in length and measure 22 inches. At two years, they are approximately three feet in length, with the average being 35 inches. At three years, the average size is 47 inches and at four years the length averages 55 inches, or just under the legal size limit. In the



Several hundred alligators were captured by Refuge personnel and moved on to private property as part of the Commission's overall program to re-establish this important form of marsh wildlife in the coastal marshes of the state.

fifth year, the average length of alligators is 66 inches or half a foot more than the minimum legal length. Six year old 'gators average 75 inches.

Sika Deer

In 1965, 12 sika deer (*Cervus nippon*) were purchased and released in a 40-acre pasture on Rockefeller Refuge. The sika deer will be kept under close watch to determine if they would be suitable for introduction into the Louisiana marshes.

At present there is over one million acres of coastal marsh land in Louisiana that is without a big game animal. The white-tailed deer ventures close to this area but is not a permanent resident in large numbers.

The sika deer has displayed its adaptability to saline conditions in Virginia and the animal has reached huntable numbers in that state.

Waterfowl Usage Study

During the winters of 1964-65 and 1965-66, aerial censuses were made of waterfowl usage on the impoundments and control areas on Rockefeller Refuge. The flights were made twice monthly and the primary objectives were to relate water conditions and the plants present to waterfowl usage.

Ten impoundments have been constructed on Rockefeller Refuge since 1954. The impoundments serve primarily as feeding and resting areas for migratory waterfowl. Although each impoundment is handled separately, two principal types of management are used. These are perma-

nently flooded freshwater and manipulated freshwater.

The impoundments and adjacent control areas are sampled annually to determine the vegetative composition of each. Also, monthly records are kept of water levels and salinities of each area. However, information is needed on waterfowl usage of each impoundment. With information on the vegetative composition, water conditions and waterfowl usage of each impoundment, definite plans can be formulated for the management of the impoundment. Not only will it be possible to determine the management systems preferred by various waterfowl species, but the study will determine if the needs of all species are met by the management systems now employed on Rockefeller Refuge.

This information will also be valuable when making waterfowl management recommendations to private landowners.

Numerous food habit studies have been made in the vicinity of Rockefeller Refuge. These studies list the foods commonly found in duck gullets in the Grand Chenier area. While this information is valuable in indicating preferred foods, it is unrelated to other factors which attract waterfowl to an area, such as water depth and food availability, cover, resting area, etc.

Studies on Rockefeller Refuge show that about 20 per cent of the seeds available to ducks during the fall are eaten before spring migration. However, widgeon grass and dwarf spike-rush vegetation are completely eliminated in many areas by spring.

Wildlife Exhibit

A special attraction to the visiting public on Rockefeller Refuge in recent years has been the wildlife exhibit that was set up near the main headquarters area. Pens house captive alligators, ducks and geese that occur on the refuge.

The area was originally set up as part of the Refuge Division Research Program. However, because of the interest expressed by persons in the area and tourists passing through the Grand Chenier-Pecan Island communities on Highway 82, an exhibit was set up and opened for public viewing. Thousands of persons now visit the area annually.

The pens include a collection of all ducks and geese native to Louisiana, plus a number of different sized alligators. Recently deer have added to the collection.

Cards identifying the characteristics of the individual waterfowl species have been attached to each pen in an effort to aid the public in identifying the birds. The waterfowl exhibit at Rockefeller Refuge is one of several exhibits in Louisiana to aid hunters in learning to identify ducks in the field.

Waterfowl Botulism

Botulism, a disease of waterfowl which killed over 500 ducks on Rockefeller Refuge in 1961, struck again in July, 1965, at Grand Chenier. The outbreak occurred 3 miles west of the Rockefeller Refuge Headquarters on private land.

The botulism is a form of food poisoning and the organism after ingestion by ducks produces a very deadly toxin. In the infested area, 25 dead and sick Mottled ducks were found.

Conditions in the infested area were similar to those on Rockefeller Refuge where the outbreak occurred in 1961. The area was in the process of drying up and decaying vegetation created conditions favorable for the organism. The die-off stopped soon after the affected ducks were noted. The area dried and the healthy ducks moved elsewhere.

Alligator Nesting Study

Observations of alligators nesting on Rockefeller Refuge were carried out during the summer of 1964 and 1965. The objectives of the study are:

1. To determine the activity of the female during incubation.
2. To determine the temperature inside and outside the nest.
3. To determine the preferred nesting habitat, nest dimensions, number of eggs present in each nest and reproductive success.
4. To determine the kind and amount of predation on alligator eggs.

For determining the nest temperatures, a Taylor Model 791 Dual Remote Recording Thermometer was used. This thermometer has two remote thermocouples and the temperature of each is recorded on a clock driven chart. One thermometer was placed inside the nest to record continuous nest temperatures. The other located outside to record air temperature to be used for comparison.

A Stephens Model F Recorder was used to record movement across the nest. A trip wire was stretched above the nest to the recorder which marked the exact time of each crossing on the chart.

During the summer of 1964, 29 alligator nests were located on Rockefeller Refuge and eleven nests were opened, eggs counted and measurements of the nests taken. There were considerable variations in the number of eggs found in each nest. The largest number, 47, was found in two nests and the smallest number was 23. All nests were located between June 14 through June 21 and no new nests were located after this date. Large clumps of wiregrass (*Spartina patens*) were placed on the outside of the nest. The inside of the nest, or the area of the nest surrounding

the egg cavity, was composed of wiregrass, but made up of a much finer consistency.

During the summer of 1965 with the use of a airplane and marsh buggy equipped with radio communication 60 alligator nests were located. Of these, 40 were opened, eggs counted, and measurements of the nests taken. The largest number of eggs found was 51, and the smallest number being 21. One nest was found with only two eggs present. These eggs were taken from the nest and incubated in the laboratory. Both eggs were found to be infertile.

Temperatures within the nest at the egg cavity averaged 83.5 degrees Fahrenheit with 74.5 degrees the lowest recorded and 90.0 degrees the highest. Outside temperatures at the nest averaged 86.9 degrees, however temperature extremes were 72.0 degrees and 107.0 degrees. Temperatures for the 1965 season compared very closely with the temperatures stated above for the 1964 nesting season.

Movement of a female over the nest was recorded seven times throughout the incubation



Intensive research data is collected from alligator nest on Rockefeller Refuge.



Various studies were carried out on the nesting habits of the Louisiana alligator. Nests were located with the use of an airplane and marked. Ground crews move in, locate the nests and the necessary information taken.



Observations were made on the nesting habits of alligators held in pens on Rockefeller Refuge. Female alligators become sexually mature when they reach six feet in length.

period (65 days), and as much as three times in a 24 hour period. The visits of the female were irregular with time intervals of 1 to 19 days. After several visits by raccons, with eggs being eaten on each visit, this nest was apparently abandoned by the female as no movement was recorded after this date.

During the 1965 nesting season, three nests were equipped with movement recorders. Movement of the female over the nest varied from one visit during the entire incubation period to as high as 18. The third nest recorded 5 separate visits by the female. The visits were more frequent during the early weeks of incubation then apparently these nests were abandoned by the female until the time of hatching. As the young alligators began hatching and calling beneath the nest material the female returned and opened her nest to release the young.

The alligator supposedly protects the nest from predators and intruders, but this was not demonstrated in this study. Several nests were completely destroyed by raccoons with the female present at the nest site. Of the 60 nests examined during 1965, only 7 alligators made attempts to protect their nests when visited by persons conducting this study.

Sarcosporidiosis in Ducks

Sarcocystis rileyi, a rice-like parasite that is found in muscle tissue, has been evident in wild ducks for many years and the literature cites incidences from practically all portions of the

United States. Numerous inquiries from hunters in recent years suggested that the parasite may be epizootic in Louisiana and prompted this study.

The study was begun in 1960 and aimed primarily at determining the species affected and the levels in infestation. The study was then expanded to compare infestation between age and sex groups and different areas in the state.

Louisiana usually winters from 5 to 6 million ducks with Mallard, Pintail, Green-winged teal, Gadwall and Lesser Scaup the major species. However, Baldpate, Blue-winged teal and Shoveler combined number well over one million birds. Also, the Mottled Duck, though not present in such great numbers, is native to Louisiana and very important to hunters in Southern Louisiana.

From 1960 to 1964, 1,553 ducks of 9 species were examined for *Sarcocystis rileyi* in Louisiana. For each bird checked, records were kept on species, sex, age, location and degree of infestation.

There was a significant difference between age and Sarcosporidiosis. Of 961 adult ducks examined, 35.7 per cent were infested, but of 552 immatures only 0.4 per cent were infested.

Sex was not a factor in infestation of adult ducks. Of 961 adults, 36.5 per cent of the males and 33.5 per cent of the females were infested. All species checked were parasitised but the Shoveler was the species having the greatest infestation rate with 78.3 per cent among adults. Blue-winged teal, Green-winged teal and Pintail followed respectively.

No great difference was noted in the annual occurrence of Sarcosporidiosis. The winter of 1961-62 was the highest with 43.0 per cent of the adult ducks. In 1962-63, 33.2 per cent were infested and in 1963-64, 36.6 per cent.

Comparing the infestation rates between two areas, Cameron Parish in Southwestern Louisiana had 36.4 per cent, while Plaquemines Parish in Southeastern Louisiana had 23.0 per cent. The fact that only a small sample was available in Plaquemines Parish on most species may have caused this difference. A large sample of Pintail was examined in both areas and Sarcosporidia infestation from both areas was very similar.

Bird Banding

As part of a continental bird banding program, research workers for the Refuge Division banded 5,145 birds during 1964 and 1965. A breakdown by species is shown on the chart.

Information from the birds banded by the Refuge Division will be joined with that of other banders to show an over-all picture on the habits of birds. Valuable information on movement, migration, longevity and the harvest is obtained in this manner.

BIRD BANDING—REFUGE DIVISION

Species	1964	1965
Lesser Scaup	3,116	165
Mottled Duck	39	311
Blue-winged Teal	149	238
Green-winged Teal	0	3
Wood Duck	13	22
Pintail	33	29
Shoveler	29	3
Gadwall	3	0
Mallard	4	13
Fulvous Tree Duck	4	35
Ringed-neck Duck	5	1
Blue Geese	34	37
Snow Geese	12	0
Canada Geese	0	20
Coot	1	776
Mourning Dove	24	13
King Rail	1	0
Clapper Rail	4	0
Horned Grebe	1	0
Pied-billed Grebe	0	4
TOTAL	3,472	1,673

Duck Potato Study

Delta duck potato (*Sagittaria platyphylla*) is a major duck food on the Mississippi Delta. At one time this species grew in tremendous stands throughout the area, but in recent years the magnitude of these stands have been greatly reduced.

In 1962, a study was set up by research personnel of the Refuge Division and Dr. Leslie Glasgow of Louisiana State University. The purpose of this study was to measure tuber production in this species and to determine the factor that affects plant growth and tuber production. The study was later expanded to include production of tubers by freshwater three-square (*Scirpus Americanus*).

Small plots were established and tuber production sampled periodically. Exclosures were built to exclude nutria, hogs and ducks, and to measure the utilization by these species.

In September, 1965, Hurricane Betsy struck the Louisiana Coast with its center passing just west of Pass-a-Loutre. The resulting high wind and water severely damaged or destroyed some of the exclosures set up for this study. These will be rebuilt and the study continued during the coming year.

Refuge Library

In order to provide storage and filing of reference material used by the Research Section of the Refuge Division, a library was added in the new office addition. Facilities were provided for a reading room for use when reviewing the literature.

At present over 100 volumes are on hand and all deal with subjects pertaining to wildlife management. Also, copies of several journals are on hand such as the Journal of Wildlife Management, Transaction of the North American Wild-



Intensive research data is collected in the production of Freshwater three-square and Delta duck potato from the Pass-a-Loutre Waterfowl Management Area.

life Conference and The Proceeding of the Southeastern Association of Game and Fish Commissioners.

In the future additional volumes will be added from time to time as they become available.

Mottled Duck Banding

A banding program on Mottled Ducks has been started on Rockefeller Refuge. Mottled Ducks do not take readily to bait and are rarely found in large enough flocks to obtain any significant number in a bait banding operation. This has been tried but only limited results have been obtained.

A method has been developed to catch young flightless mottles and molting adult birds with Rockefeller Refuge with very good results. Over 300 mottled ducks were banded in one summer the aid of airboats and floodlights powered by a small generator. This method has been used on and as many as 75 birds were banded in one night. This operation is dependent upon a good water supply in the marsh. By cruising slowly around the shallow marsh impoundments family groups could easily be spotted with these lights from 75 to 100 yards away. If the approach was slow and engine noise held at a constant pitch, the entire brood could easily be netted.

The lights were mounted on the bow of the airboat and extended upwards to about 3 feet, making the operator and the catcher work behind the lights and away from the sight of the birds. This method was tried on coots and in four trips 720 coots were banded. Also, diving ducks were captured but on a limited scale. These birds would dive before an approach could be made. Puddle ducks able to fly would not hold for these lights, therefore an approach could not be made.

Sesuvium Study

In recent years a small fleshy halophytic plant has appeared in tremendous stands on Rockefeller Refuge. This plant is a seapurslane (*Sesuvium portulacastrum*) and invades areas previously flooded with brackish water.

This species has wide usage by ducks in the brackish marsh areas, and has become a major duck food plant. Yet very little is known about the growth habits and requirements.

A study was set up to gather information essential for managing this species. During this study checks were made to determine seasonal growth rates, the effect of competition, soil requirements, moisture requirements, salinity ranges, seed production and waterfowl usage.

In recent years the southern portion of Louisiana has been severely affected by extensive droughts. As the marshes begin to dry, in late March, *Sesuvium* begins to make an appearance on the higher regions which are exposed first and finally advancing over the entire area as the water evaporates or is drained off. By early May it is well advanced in flowers. Flowering and fruiting are complete by the end of June and the seeds shattered and growth is completed by mid-July.

Waterfowl Inventory

In order to measure waterfowl usage of Rockefeller Refuge and Marsh Island Refuge, periodic aerial inventories are made on the refuges during the wintering season.

Refuge Division biologists make the count on Rockefeller Refuge and Fish and Game Division biologists make the Marsh Island inventory. Over a period of years this information can be used as a basis for evaluating management practices on the refuges.

The included tables list the waterfowl present on both Rockefeller Refuge and Marsh Island Refuge for the periods shown. Also, the data is broken down into species for each period during the 1964-65 wintering season.

WATERFOWL INVENTORY

Species	Rockefeller Refuge		Marsh Island Refuge	
	Jan. 1964	Jan. 1965	Jan. 1964	Jan. 1965
Mallard	14,000	3,700	11,000	1,000
Gadwall	64,000	74,900	70,000	10,000
Baldpate	19,000	28,400	19,000	8,000
Green-winged Teal ...	70,000	24,000	17,000	3,000
Blue-winged Teal	14,000	13,000	15,000	2,000
Shoveler	11,000	25,000	15,000	8,000
Pintail	41,000	67,000	8,000	6,000
Mottled duck	650	850	8,000	1,000
Scaup	4,000	375	500	500
Mergansers	2,500	150	300	500
Blue & Snow Geese ...	16,000	14,000	42,000	18,000
Coots	15,000	71,000	43,000	8,000

Cooperative Studies

The Refuge Division is one of the cooperators in the Cooperative Wildlife Research Unit and Cooperative Fishery Research Unit at Louisiana State University. Participation by the Refuge Division has not only been financial, but active assistance has also been given to faculty and students in four studies currently underway on Rockefeller Refuge.

Other studies were conducted by L.S.U. faculty and personnel of the Refuge Division Research Section. A description of each follows:

THREE-CORNERED GRASS STUDY

Preliminary studies on three-cornered grass were conducted by the Refuge Division in 1963. The studies were continued and expanded by the Wildlife Unit.

A study of the ecology and management of three-cornered grass and coco grass was begun in 1965. Angelo W. Palmisano was assigned to the study with John D. Newsom as supervisor. The objectives of the study were to determine the edaphic and biotic conditions necessary for optimum growth of the plants and to develop methods of propagation under natural and experimental conditions from seed and root stocks.

Three study areas were established in southwest Louisiana; two are in Cameron Parish and one in St. Mary's Parish. Transects were run through these sites and vegetative composition was determined. Soil samples were taken and wells established to measure soil water salinity and water level fluctuation.

Plastic pools were set up on Rockefeller Refuge in which growth studies will be made of root stocks and seed under controlled conditions.

Seed germination studies have been initiated using seed collected near the study areas. Maximum seed production for the areas has been determined.

Soil samples taken from two of the study areas are in the process of being analyzed at the soil testing laboratory. The portion of soil samples which was not used for analysis was saved so that the relative root composition in the areas might be determined.

CATFISH STUDY

This study is conducted on Rockefeller Refuge and adjoining water bodies by the Louisiana Cooperative Fishery Research Unit. The study is being made by Wesley G. Perry, Jr., Graduate Assistant, under the supervision of Dr. R. O. Smitherman.

The objectives of the study are to determine the effects of salinity upon the distribution and relative abundance of blue catfish and channel catfish, to determine the food habits, age compo-

sition and growth rates of the two species in brackish water.

Sampling stations were established in April, 1965, and monthly samples have been taken by means of an otter trawl at the stations spaced at intervals from the Gulf of Mexico to Grand Lake, a large freshwater body of water. Rotenone has been used to verify trawling results. Other types of gear used were trot lines, trammel nets, wire traps and slat traps.

Sampling throughout November, 1965, yielded a total of 71 species representing 35 families of fishes.

All species have been collected from habitats varying from near-fresh to salt water. Salinity and temperature have been determined by the use of a Solu Bridge conductivity meter and by titration using the silver nitrate method. Oxygen, carbon dioxide, and alkalinity readings have been made at irregular periods. A Secchi disk was used for the determination of turbidity values.

Pectoral spines have been removed from a large number of blue and channel catfish for subsequent age and growth studies. Length and weight data were collected for the determinations of annuli. Thin cross sections of 0.5 millimeters or less will have to be cut from the spines.

An effort has been made to improve the sectioning of these spines. Usually, sections are obtained through the use of some sort of saw. Presently, a decalcification method is being developed. This method is apparently effective and should give a much better section with less effort. Stained slides may be obtained and kept for future reference. However, there may be a fraction of error in body length—scale radius relationship due to shrinkage. This will have to be further tested.

Stomachs from a number of catfish have been preserved for food habit studies. Samples of fish collected on the project area (Rockefeller Refuge) have been prepared and contributed to the Louisiana Wild Life and Fisheries Commission for future listings of fishes in this state.

CONTROL OF UNDESIRABLE MARSH PLANTS

This cooperative study between L.S.U. and the Louisiana Wild Life and Fisheries Commission was set up in 1963. Its objectives were to test and develop machines which could be used to cultivate marsh land and to measure the effects of the machines for controlling plant species composition and density.

During 1965 a large study area was set up on Rockefeller Refuge at Price Lake and the Experimental Area. Study plots were made with a rotary tiller mounted on a marsh buggy.

The performance of this machine was satisfactory, and studies will be continued on its effect on vegetation.

The study is being conducted by Larry Mc-



Detailed ecological studies are carried out by biologists of the Refuge Division and Louisiana Cooperative Research Unit on various important waterfowl food plants. Pictured are tanks which contain plants that are exposed to various management techniques for evaluation.

Neese and Ronald Sarver and L. L. Glasgow and W. H. Carter supervising the study.

WIREGRASS STUDY

A study on wiregrass (*Spartina patens*) was set up on Rockefeller Refuge during the summer of 1965. The purpose of the study was to determine the factors affecting the growth and survival of wiregrass.

The study is being made by Kenneth Babcock under the supervision of L. L. Glasgow. Fifteen plastic pools were set up and water of different salinity added to certain pools and at different depths. Wiregrass was grown in the pools and records kept on the affect of various salinities and water depths on the species.

Wiregrass is the dominant plant along the Louisiana coast. It is of very little value to ducks, and in many areas grows in such dense stands that valuable duck foods are crowded out.

This study is designed to gain information on the basic biology of the plant which can serve as a starting point for other studies on management of the species.

Cooperative Canadian Banding

During the past decade Louisiana has sent a representative to Canada each year to assist in a cooperative duck banding project. Banding crews work throughout Canada during each summer in order to band the birds prior to their southward migration.

Louisiana's representative during 1964 was biologist Ted Joanen of the Refuge Division. Mr. Joanen was a member of a two-man crew which worked on Lake Martin in South Central Saskatchewan. During 5 weeks of duck trapping in that area the crew banded a total of 3,241 ducks. Species captured in largest numbers were Mallard, Pintail, Blue-winged teal and Green-winged teal.

The recovery of banded birds at a later date provided valuable information on movement, mortality, longevity and so forth.

Water Pollution Control Division

THE DIVISION OF WATER POLLUTION CONTROL, one of eight divisions of the Louisiana Wild Life and Fisheries Commission, is charged with the responsibility of supplying technical, scientific, and enforcement needs of Louisiana's pollution control authority, the Louisiana Stream Control Commission. This Division also serves as the enforcement arm of the Louisiana Wild Life and Fisheries Commission in matters pertaining to stream pollution.

The office and central laboratories are located on the campus of Louisiana State University, Baton Rouge, Louisiana, providing ready access to the University's library and convenient availability for consultation with the highly technically trained members of the University's faculty. In addition, there are two mobile laboratories strategically located in the state that serve the purpose of providing facilities for basic and preliminary waste and water analysis. These mobile laboratories can be moved immediately to any location in the state for use in the event of a major pollution situation.

During the calendar year 1964 the Division has engaged in the following activities:

1. Continued surveillance of the Mississippi River from Baton Rouge to New Orleans, and intermittently to the mouth of the river.
2. Continued a statewide water quality program initiated in mid-1958 which covers 59 sampling points on 27 major streams or drainage basins in the state. Thirteen parameters are analyzed for and recorded on a monthly basis.

These data provide a continuous record of water quality throughout the state. In addition, the data are referred to in determining whether or not a given stream can assimilate a waste proposed to be discharged to it from an industry or a municipality.

3. Collected and assimilated pertinent data relative to water quality of the Atchafalaya Basin and waste discharges to this basin.
4. Maintained close surveillance on the 47 raw sugar factories and refineries.
5. Provided the Louisiana Stream Control



ROBERT A. LAFLEUR
Chief

Commission with technical information for seven meetings.

6. Prepared for and participated in an enforcement conference called by the U. S. Public Health Service relative to pollution caused fish kills caused by pesticides on the Lower Mississippi River.

Representatives of the Louisiana Stream Control Commission have served in an advisory capacity on a technical committee and in a cooperative study with the U. S. Public Health Service of the pesticide situation in the Lower Mississippi River.

7. Conducted investigations of approximately 50 fish kills in the state. At least 40 of these kills were caused by pesticides in the cane growing area during the pesticide application season.

During the Calendar Year of 1965 the Division was engaged in the following activities:

1. Investigated and determined the cause of 40 fish kills in the state. Thirty-four of the kills occurred in the cane growing area and were caused by runoff from cane fields during heavy rains following pesticide application.

Three large fish kills were caused by the following: (a) a high thermal condition; (b) pesticide accidentally spilled in Red River by a firm in Shreveport, Louisiana; (c) an oxygen depletion occasioned by the discharge of oxygen consuming waste from municipal and industrial sources in Twelve Mile Bayou near Shreveport.

2. Continued surveillance of the Mississippi River from Baton Rouge to below metropolitan New Orleans.
3. Continued a statewide water quality monitoring program.
4. Gathered current data on industrial discharges to the Atchafalaya River Basin.

5. Initiated an intensive aerial surveillance over coastal and other selected areas of the state for oil field pollution.
6. Provided technical information for seven meetings of the Louisiana Stream Control Commission.
7. Maintained close surveillance over discharges of all raw sugar factories and refineries in the state.

During 1964 and 1965 the Louisiana Stream Control Commission considered 54 industrial proposals for waste discharges to the streams in the state. Included in this heavy industrial influx were 7 paper mills, 9 petrochemical plants, 17 chemical plants, 4 oil refineries, 5 food processing plants, and 9 other industries of a miscellaneous nature, 3 of which were menhaden (poagy) fish oil processing plants.

ENFORCEMENT ACTIVITIES

The Division of Water Pollution Control has, under provisions of Louisiana Revised Statutes of 1950, Title 56, Sections 322 and 362, filed charges five times in various district courts. Under Title, 38, Section 216, Act 203 of 1952 Legislature, the Division has filed charges six times for violations involving the discharge of oil field salt water. Regarding Title 38, Section 216, an "open season" is prescribed from October 1 to December 31 of each year during which oil field operators are legally authorized to discharge oil field salt water and other contaminating wastes. This provision has caused much difficulty in effective pollution control measures. There is, therefore, an obvious and serious need to secure legislation action, to amend and correct this situation for the reason that many agricultural and other interests are being interfered with as a result of this legal permission to discharge these contaminating wastes which cause moderate to severe pollution.

Perhaps the greatest and most significant strides during the past two years have been via

the actions of the Louisiana Stream Control Commission and the Louisiana Department of Conservation. These joint efforts are as follows:

1. On September 1, 1964, the Louisiana Stream Control Commission promulgated an order requiring all oil producing and processing installations in Caddo Parish to submit, within ninety days from the effective date of order, plans for disposal of oil field brine to other than surface areas (Caddo Lake, Cross Lake, Twelve Mile Bayou, and Black Lake). The second part of this order requires that one year from the effective date no oil field brine will be permitted to flow to or be discharged to the aforementioned waters. This order is currently being rigidly enforced, and it is sincerely hoped that there will be few if any recalcitrant operators who will fail to comply with the order.
2. Following a long sought public hearing, held in Alexandria, Louisiana, August 1964, in the matter of oil field salt water in the Little River Drainage Basin (Grant, Winn, La-Salle, and Catahoula parishes), all oil operators were required to submit plans for disposal of waste oil and salt water to other than surface areas (Little River and its tributaries. This matter is scheduled for complete review early in 1966.

However, in order to secure compliance with the two orders aforementioned it was necessary to issue 427 Notices of Determination and 60 Cease and Desist Orders in the Caddo Parish area. In the Little River Drainage Basin there were 78 operators of record, of this total 56 responded and complied with the original order; following the issuance of 22 Notices of Determination it became necessary to issue Cease and Desist Orders to less than a half dozen operators.

Progress in salt water pollution abatement in these two areas is best reflected by the fact that

The Stream Control Commission. Left to right: Patrick Kileen, Dept. of Commerce and Industry; Leo Hough, Dept. of Conservation; John Trygg, Dept. of Health; Joe Hair, Jr., Wild Life and Fisheries Comm.; Ernest Epps, Dept. of Agriculture and Immigration; Robert La-fleur, Executive Secretary.



approximately 200 sub-surface injection wells have been applied for and/or presently in operation to dispose of oil field brine to subsurface salt water sands in the Caddo Parish area. In the Little River Drainage Basin (Grant, Winn, La-Salle, and Catahoula parishes) at least 40 sub-surface injection wells have been applied for and/or now in operation.

The cooperative action of the Inspection and Enforcement Division teams, Louisiana Department of Conservation, has been of invaluable assistance in curtailing pollution from salt water discharge. This department, by administrative authority and action, has suspended many permits to transport produced oil which very effectively convinces violators that pollution of this nature is no longer to be tolerated or permitted.

The Louisiana Stream Control Commission has also issued more than 36 Notices of Determination for violations of its rules, orders, and regulations throughout the state involving many types of pollutants.

Early in 1965 one of the large paper mills in the state (Olin Forest Products) at West Monroe, Louisiana, placed in operation an extensive system of waste treatment facilities where none previously existed. Results of this large expenditure of funds and efforts can logically be expected to reduce polluttional discharge to the Ouachita River. To this firm goes a special note of appreciation for accepting its responsibility in pollution abatement and thus becoming a better corporate citizen. Also, the pollution load of Pearl River has been significantly reduced through the construction and operation of a huge waste treatment facility by a large paper mill at Bogalusa.

Stream pollution from raw sugar factories particularly on Bayou Teche has become more troublesome during the past two years as reflected by weekly sampling of factory discharges. It must be recognized that this situation was considerably aggravated by two very damaging hurricanes, one in 1964 and another in 1965. Low flows, and in many instances zero flow, further added to this serious problem by creating a stagnated condition characterized by offensive odors and undesirable water quality. Contact with the offending factories is now under way and we feel that



Aerial View of Aeration Pond. Effluent enters at upper left and discharges at lower right.

remedial action will be taken before the next grinding season.

Pollution from gravel mining operations, particularly in the Florida parishes on the Amite, Tangipahoa, and (to a somewhat lesser degree) the Bogue Chitto rivers has been a matter of more than passing concern. Criminal charges were filed in four cases during 1965; these charges are currently pending. The Louisiana Stream Control Commission has decreed that an order be prepared for its consideration and probable promulgation. This order is presently being prepared.

FEDERAL LEGISLATION

Early in 1965 legislation was introduced in the Congress of the United States. The pollution control authority of Louisiana along with the authorities of more than a majority of the other forty-nine states actively opposed this legislation. Despite the opposition this bill was favorably voted by Congress and was signed into law by the President of the United States, October 1965. Briefly, this law requires that water quality standards on all interstate waters be promulgated to meet the approval of a Federal agency by July 1, 1967. The law also requires that a letter of intent to promulgate such standards be submitted to the Secretary of the U. S. Department of Health, Education, and Welfare not later than July 1, 1966. Compliance with this law will unquestionably significantly increase the work load of this Division and that of the Louisiana Stream Control Commission.

It is a matter of serious conjecture that the promulgation of such standards on interstate and/or other waters will provide or produce a panacea for our stream pollution problems. Present indications are that this legislation is merely the forerunner of bolder legislation to follow.

It is the consensus of the best minds in the field of water pollution control endeavors that our most crying need is for intensified basic research in the methodology of waste treatment. Since the period immediately following World War II there has been a steady increase in wastes produced



Small Cascade Boards Between Ponds. Cascade boards between No. 2 pond and No. 3 pond.

and discharged to public waters about which very little is known relative to their effect on receiving waters. In short, the technology of control is virtually void in many instances—a situation leaving much to be desired.

Technical Investigations—Richard T. Gregg, Assistant Chief; Louis R. Kuss, Chief Chemist; George J. Camatsos, Chemist; Thomas J. Gilbert, Biologist; Jacob P. Yelverton, Biologist; Darrell B. Reed, Engineer and James S. Mathis, Engineering Aide III.

Waste Disposal Inspectors—Rene L. Bourriague; Warden C. Dixon, Elwood W. Goodwin, Albert E. Howard, Percy A. Paul, Larry D. Racca, Lubert L. Reed and Leslie J. Sewell.

During this past biennium, greater emphasis has been placed upon the conservation and clean-up of our nation's waters than at any other time in our history. The State of Louisiana, endowed with unequaled supplies of water, has made great strides toward insuring that these existent supplies are not rendered unsuitable for use. The progress made in the field of water conservation and improvement is a direct result of the cooperative efforts and endeavors of the Division of Water Pollution Control and responsible municipal and industrial officials.

The nucleus of this Division has been built around two large, well equipped biological and chemical laboratories located on the campus of Louisiana State University, Baton Rouge, Louisiana. Our presence on the campus affords not only a quiet academic surrounding with complete library facilities, but also an available staff of experts in fields ranging from bacteriology to zoology. Additionally, it enables this organization to more closely monitor the activities of one of our largest industrial complexes. The principal function of this laboratory is to conduct various chemical and biological analysis on samples submitted by investigating teams from this office, waste disposal inspectors, individual citizens, and many industries.

The data obtained from the laboratory tests are interpreted and evaluated by members of the staff which includes: biologists, bacteriologists, chemists, biochemists, and engineers. The conclusions and recommendations of these individuals are then forwarded to the members of the Stream Control Commission and to the individual or industry concerned.

The major questions confronting this organization are:

1. What effect will the discharge of a given volume of a specific waste product have upon the physical, chemical and biochemical properties of a stream?
2. What type of corrective treatment is necessary before said waste can be discharged into a stream?



Chemical and biological laboratories of the Division of Water Pollution Control are located in this wing of the Geology Building on the Louisiana State University Campus in Baton Rouge.

3. How long will it take a given stream to recover from the discharge of this waste?

Some of the various types of waste materials which are submitted for analyses or as follows:

1. Oil residues and phenolic wastes from petroleum and chemical industries.
2. Any substance thought to contain pesticide residues.
3. Gravel pit washings.
4. Process and wash water from sugar mills, pulp and paper mills, and food processing plants.
5. Oil drilling muds and salt water brine from petroleum production fields.
6. Sewerage plants, oxidation ponds, and septic tank influents and effluents.
7. Wash waters, spoiled fluids, and paunch contents from slaughter and packing houses.

It can be readily seen from the above that an enormous variety of substances are being introduced into our waters, both organic and inorganic.

The most desirable method of treating wastes is to recover these wastes for use or reuse. However, in the majority of cases this is not economically feasible. Therefore, the primary requisite in solving a pollution problem or in selecting a method of treatment prior to discharge is knowledge of the physical state and chemical composition of the waste in question.

The fundamental parameter used in determining the relative condition of a stream, its ability to maintain a suitable aquatic fauna, is its dissolved oxygen content. The dissolved oxygen (DO) content is generally determined using the sodium azide modification of the Winkler Method.

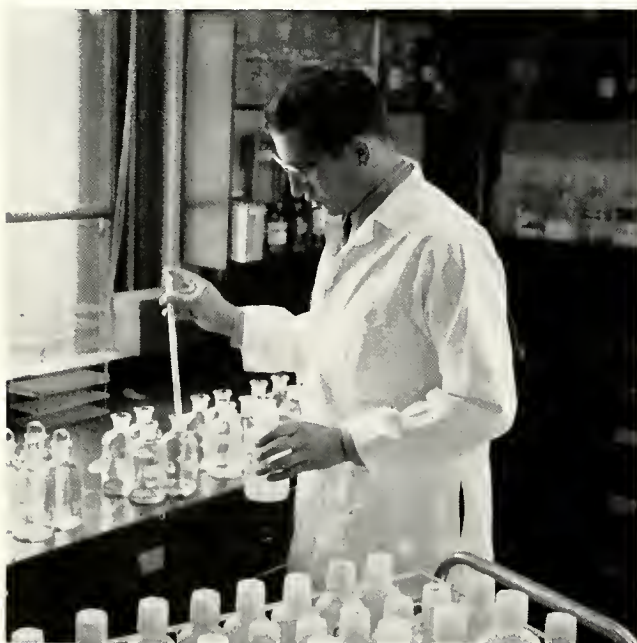
The most important single determination used for the analyses of decomposable organic matter by means of aerobic biochemical action is referred to as the Biochemical Oxygen Demand (BOD). This BOD analysis furnishes the investigator with

a means of determining the amount of oxygen required by microorganisms (bacteria) to decompose (stabilize) a given amount of waste matter. The numerical value of this test is usually expressed in parts of oxygen per million parts of waste material.

Briefly, the procedure used in carrying out a BOD analysis is as follows: Various quantities of the sample to be tested are prepared in duplicate. These are then mixed with water which has been saturated with oxygen (dilution water). The dissolved oxygen (DO) is immediately determined on one-half of these samples. The remaining half of the duplicate samples are placed in a constant temperature room where they are allowed to incubate for five days at 20°C. After this period of incubation the residual dissolved oxygen is then measured and the BOD values are computed.

The data obtained from BOD and DO analysis make it possible to calculate, with a fair degree of accuracy, the ability of a stream to assimilate wastes of different composition. There are, of course, many other factors that must be taken into consideration, such as: (1) thoroughness with which the waste is mixed with water; (2) changes in the solubility of oxygen in water with changes in temperature, the former increasing as the latter decreases; (3) lowered microbial activity with a decrease in temperature; (4) rate of flow of the receiving stream; (5) changes in the solubility of oxygen in water with an increase of soluble salts; (6) variations in the concentration of waste matter.

Table No. I gives an indication of the number of BOD analysis completed during the past biennium.



BOD Analyses. A staff member prepares sugar mill and paper mill samples for BOD analyses.

Table No. 1
B.O.D. ANALYSES—1964-1965

<i>Source of Sample</i>	<i>Number of Samples Analyzed</i>	<i>Per Cent of Total</i>
Sugar Mills	605	28.70
Municipal Sewage	195	9.25
Mississippi River	215	10.20
Food Processing Plants	150	7.19
Slaughterhouses	75	3.56
Pine Products Plants	27	1.28
Cotton Seed Oil Mills	32	1.53
Petroleum & Chemical Plants	24	1.14
Paper Mills	255	12.10
Miscellaneous Water	525	24.99
TOTAL	2,103	100.00

Industries concerned with inorganic waste products have a problem of a somewhat different nature. Normally, inorganic wastes are not subjected to any biological treatment because of their relatively inert nature as a substrate for microbial development. In addition, the discharge of these wastes, because of their high alkalinity, acidity, or toxicity on microorganisms, may so upset the natural balance of life in waters that natural biological purification cannot progress normally. Therefore, these wastes are usually controlled by physical or chemical separation.

As a result of the many technologic advances which have come forth during the last few years, we have been forced not only to change our way of living, but thinking as well. Modern instrumentation has provided us with the necessary means of detecting concentrations of materials never before thought possible, consequently, substances once thought to be free of contamination can now be shown to contain harmful materials. This is vividly exemplified by the current emphasis on pesticides and pesticide residue analysis.

Pesticides, by virtue of application methods, both direct and indirect, come into contact with just about all things ingested by man and animals. The isolation and identification of a particular pesticide presents many problems to the workers in this field. Generally, the major problems encountered are as follows: (a) Selection of a suitable solvent, one in which only the pesticide is soluble and it itself being easily reduced in volume without subsequent loss of the pesticide. (b) Removal of any interfering substances.

Significant quantities of a pesticide are generally extracted or concentrated by means of liquid-liquid extraction techniques. This is accomplished by adding small quantities of a selected organic solvent into an aliquot of the contaminated sample. This mixture is then agitated, stirred or shaken, depending upon the vessel used, so that all of the organic solvent comes into contact with all of the water phase. The layers are allowed to separate and the organic fraction is removed. (The pesticide being soluble in the organic solvent leaves the water and concentrates itself in

the organic solvent.) This extraction procedure is repeated twice more; the organic extracts are combined and then reduced in volume by evaporation. This concentrated fraction can now be subjected to various specialized methods in an attempt to remove any interfering substances. Some of the procedures used to remove these impurities are: (a) acetonitrile partitioning, (b) column chromatography using a Florisil column, (c) column chromatography using a mixture of Magnesium Oxide and Celite, and (d) saponification.

Following the "cleanup" procedures the extract is reduced to a suitable volume (approximately 0.01 ml) and is then injected into the gas chromatograph.

Gas Chromatography is a physical method of separation in which the components to be separated are distributed between two phases, liquid and gas. Separation depends on the relative affinity of the immobile phase for the various pesticides. Simply stated, a gas chromatograph functions as follows: (1) A carrier gas (mobile phase) is introduced under pressure so that it will flow through a packed column. This carrier gas is an inert gas and its rate of flow through the column is controlled by various devices such as pressure regulators and rotameters. (2) The columns are nothing more than small diameter tubes which have been packed with a sorbent. This sorbent material is composed of an inert material such as diatomaceous earth (Solid Support) which has been previously coated with a non-volatile substance such as Dow-Corning high vacuum grease. (Liquid Phase.)

When a sample containing a mixture of components is injected into the moving gas stream, the various components pass through the column at different rates depending on their respective volatilities and interactions (adsorption) with the substances contained in the column. Therefore, the various components leave the column at different time intervals. As each component leaves the column it is carried to a highly sensitive electron capture detector. The detector produces an electronic signal which is recorded on a chart.

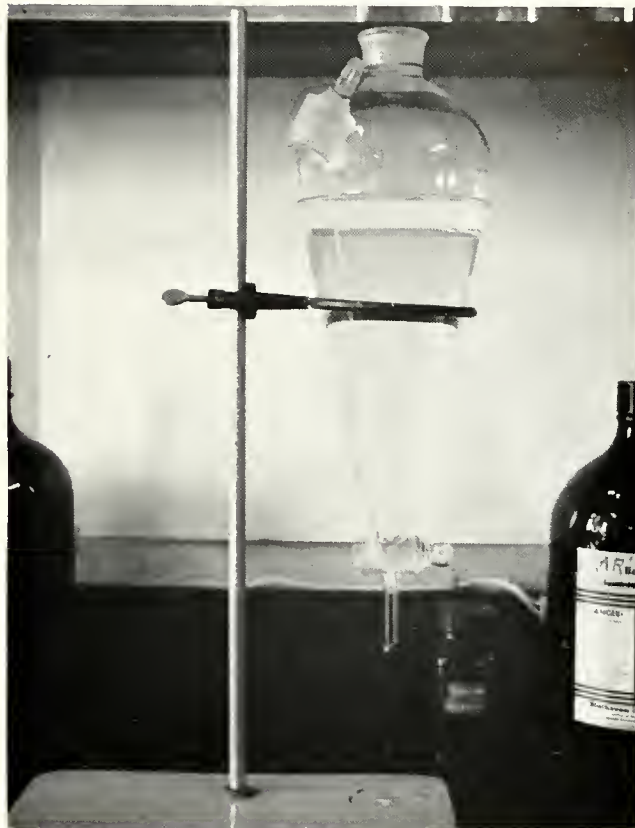
Identification and quantitation of a component is accomplished by comparing the retention time and peak height of the substance in question with the retention time and peak height of a pure compound.

Frequently, the results obtained from a particular column are confirmed by reinjection (sample size permitting) into a column containing a different substrate, thereby, obtaining different retention times.

Thin layer chromatography, routinely used, not only provides us with another confirmatory method but also provides an excellent cleanup and separation procedure. This method makes it possible for us to measure and identify relatively pure compounds with a minimum of interference.

Of particular importance is the frequent separation of components having approximately equal retention times.

Thin layer plates are prepared by making a slurry of water and some selected substrate such as Silica Gel G, Alumina G, etc., which also contains a binding agent. The slurry is applied over 200 mm x 20 mm glass plates using a variable thickness spreader. After the plates have



Liquid extraction of pesticide residue using a two liter separatory funnel—note the separation occurring between the two layers.



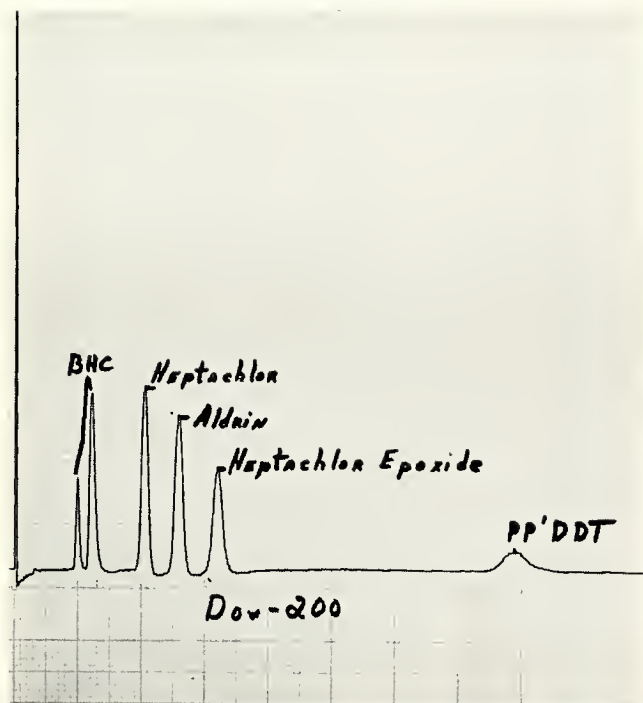
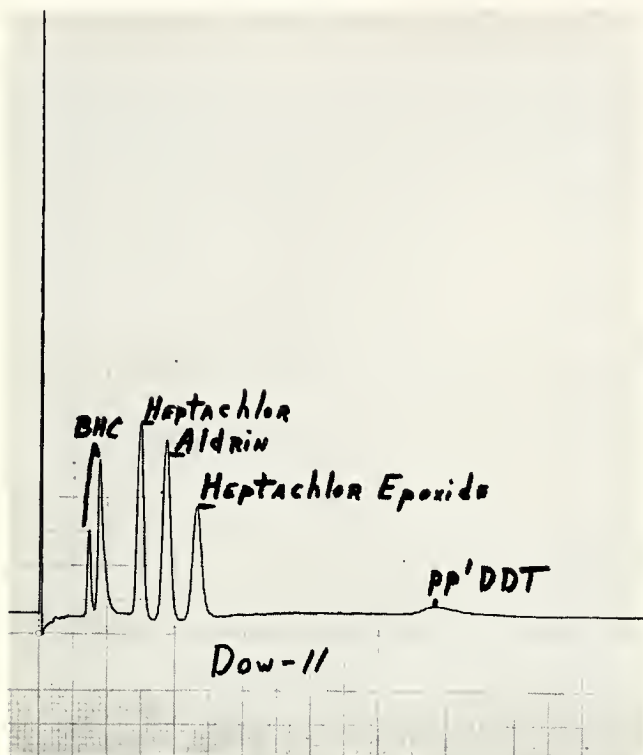
Perkin-Elmer Model 800 Gas Chromatograph as used principally for pesticide residue work. The carrier gas (nitrogen) passes through the rotameters into the packed columns and on to the detector.

set, they are dried in an oven and stored for future use.

Using a lambda syringe or pipette, the extracts are spotted along the base line of the plate. Selected standards are applied in a like manner. During this application procedure a gentle stream



Thin Layer Chromatographic Plate in developing chamber. As the solvent front moves up the plate the components of a DDE, Dieldrin, mixture separated. Each component of the mixture traveling only as far as the pure compound itself.



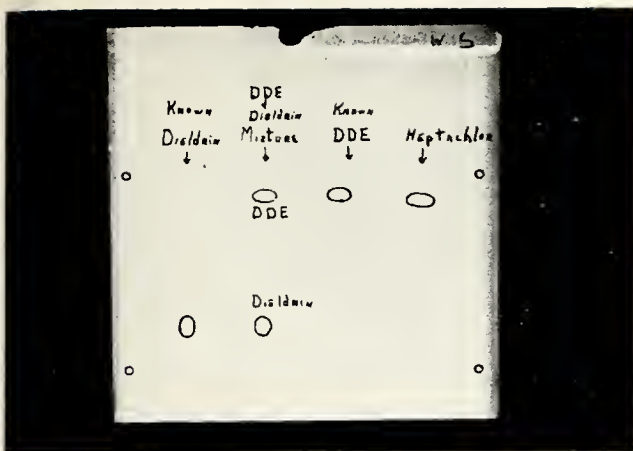
Chromatograms from GLC showing the separation of a five component mixture on columns containing Dow 11 and Dow 200 respectively.

of air aids in evaporating the solvent and in keeping the spot to a minimum size.

The spotted plate is now put in a tank in such a manner that the lower edge of the plate is in contact with the organic solvent therein. The solvent is allowed to travel up to the top reference line, a distance of 10 cm; then the plate is removed and the solvent allowed to evaporate. A chromagenic agent such as Rhodamine B in alcohol is sprayed over the plate which is then exposed to an ultra-violet light source. Within minutes those areas of the plate containing the standards or other areas containing heavy concentrations will fluoresce. The zone of travel of an extract is sectioned in relation to the position of the standards on the plate. The substrate in each suspected zone is removed from the plate by vacuum and retained in an eye dropper plugged with glass wool. The extract contained in this fraction is eluted from the substrate with a small quantity of organic solvent; is reduced to a suitable volume and injected into the gas chromatograph. Again, the retention times and peak heights obtained are compared with the standards to verify the identity and concentration of the pesticide present.

The introduction of thin layer and gas chromatography into this laboratory has made it possible for us to separate, identify and quantitate nanogram (10^{-9} g) concentrations.

The IR-5 Infrared Spectrophotometer has played a major role in our analyses, particularly so in the identification of oils and oil based muds. The majority of complaints originate with oyster farmers in the coastal areas; others come from individuals who live in oil producing areas. To-



Developed Thin Layer Plate showing that the two components did separate and the Rf values obtained were identical to those of DDE and Dieldrin.

day's analytical procedures make it relatively easy to extract, cleanup, and identify oil residues from both mud and water samples.

Another form of analysis frequently used by this organization is the bioassay. This technique provides valuable information on the properties of a particular waste product. The methods that we use are based on two concepts: (1) The substance itself may actually be toxic to fish. (2) The second concept is somewhat indirect in that although the substance may not in itself be toxic to fish it may prove to be detrimental if it is capable of interrupting the necessary food cycle.

The procedure for conducting a bioassay is as follows: (a) The test animals are acclimated to laboratory conditions. (Blue Gills are used in testing for direct toxicity and *Daphnia magna* for indirect toxicity.) (b) Testing vessels are set up containing a good grade of distilled water to which various mineral salts have been added. (c) Various concentrations of the substance to be tested are added to the vessels over a wide range. (d) Observations are made over 24, 48, 96 hour periods.

The results of the bioassay are usually reported as a 24 or 48 hour TLm, that is, the concentration of the substance which will kill 50 per cent of the test organisms in a given period of time. These results are of great value in determining the maximum concentration that a healthy fish community in a stream may be expected to tolerate.

FIELD ACTIVITIES—NEW ORLEANS AREA

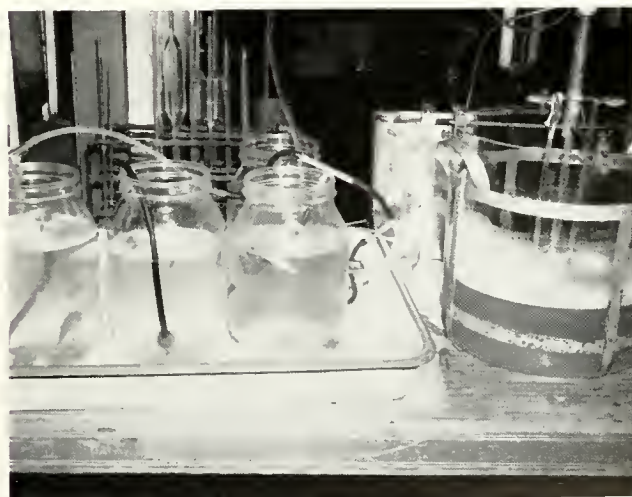
The activities of the Division of Water Pollution Control in the New Orleans area have been varied and manifold during the past two years. In addition to routine fish mortality investigations and chemical and physical determinations on water bodies in Orleans Parish and adjacent parishes, systematic aerial surveillance of offshore and marshland oil producing areas has become a



Infrared Spectrophotometer used principally in the identification of oil residues.

reality. Aerial surveillance in this area has resulted in the finding of more than one hundred violations ranging from heavy oil in bleed water discharges to pipeline breaks and blown out wells. Due in part to the excellent cooperation of the Coastal Waste Control Section of the Division of Oysters, Water Bottoms and Seafoods, all of these violations have been corrected. Continued surveillance of this type is needed and will be an integral part of the work schedule of the biologist assigned to this area in the future.

An account of the Division activities in the New Orleans area would not be complete without mentioning two chemical surveys presently being conducted. One of these surveys is underway in the Lake Hermitage area of Plaquemines Parish, and is designed to detect contamination of estuarine waters by agricultural pesticides that are being used on sugar cane fields. Drainage from these fields is to the Lake Hermitage area. This survey is being conducted in cooperation with the Louisiana State Board of Health. The assignment



Bioassay technique using various dilutions to determine the degree of toxicity of various test materials.

of the boat "Sauger" has greatly aided in conducting work of this nature.

The second survey underway involves the waters of the New Orleans Ship Channel, Intracoastal Waterway, and Lake Borgne. This survey is designed to detect harmful quantities of chromates (a chemical used as a corrosion inhibitor) that enter the above mentioned waters due to present discharges of two industries located near the intersection of the New Orleans Ship Channel and the Intracoastal Waterway. This survey is also being conducted in cooperation with the Louisiana State Board of Health.

FISH KILLS

During the past two years the Division of Water Pollution Control has continued to investigate numerous kills attributable to both natural and man-made factors.

Most of the natural kills and some of those attributed to man's activity have been caused by depletion of dissolved oxygen. Hurricanes "Hilda" in 1964 and "Betsy" in 1965 caused widespread coastal and inland oxygen depletions and ensuing fish kills as a result of deposition of large amounts of detritus in waterbodies and flooding of veg-

etated areas. The affects of "Hilda" were most notable west of the Mississippi River while the affects of "Betsy" were most apparent east of the river. Most of the man-made oxygen depletions the past two years seem to have been caused by combined discharge of domestic sewage and industrial effluent. However, some difficulty has been encountered with discharges from sugar factories during the 1964 and 1965 grinding seasons, a condition that had not occurred during the last ten to twelve years.

In 1964 and 1965 the foremost activity of man contributing to fish mortalities has continued to be widespread agricultural use of insecticides, particularly the application of Endrin for cane borer control. Moderate numbers of kills were recorded in the cane growing area during the dusting season of 1964, while in 1965 no less than 50 kills in the cane growing area were attributed to insecticides. The increase in 1965 reflects the greater frequency of heavy rain showers during the dusting season with subsequent runoff carrying the insecticides into the waterbodies. Fortunately the Division has been equipped with gas chromatograph and thin layer chromatography apparatus for the past two years and is no longer dependent on elimination of other possible causes to indicate that insecticides are responsible for fish kills. In all cases where insecticides have been blamed for kills, their presence in significant quantities has been confirmed by chromatographic procedures. Several lesser fish mortalities have been caused by discharges from pesticide formulation plants and loss of materials in the service areas of aerial applicators. One massive Red River fish kill in the Shreveport area was caused by accidental loss of some 1,500 gallons of Toxaphene concentrate (6 lbs./gal.) in the service area of a chemical company.

Louisiana continued to be plagued by sporadic fish kills in the Mississippi River and Atchafalaya Basin during the winter of 1963-1964. These kills appeared to be identical to those of the preceding winters of 1960-1961, 1961-1962, and 1962-1963.

Accompanied by U. S. Public Health Service personnel, members of the Division collected numerous samples of water, mud, and dying fish during the month of December. These samples were frozen and taken to the Robert A. Taft Engineering Centre, Cincinnati, Ohio, for analyses. For the remainder of the winter and spring of 1964, personnel of the Division continued to collect these samples. Many were subjected to analyses in our laboratory while others, particularly blood samples obtained from both dying and apparently healthy fish, were frozen and then forwarded to Cincinnati. Analyses conducted both locally and in Cincinnati indicated the presence of minute quantities of Endrin (fractions of a part per billion) in water samples and much higher concentrations in the tissues (from fractions of a part per mil-



Aerial surveillance of a coastal oil producing area.



Mobile Laboratory Unit. This mobile laboratory on permanent loan from the U.S. Public Health Service has been stationed in New Orleans for the past two years.

lion in the blood to several parts per million in the liver and fat) of dying fish. Bioassays conducted in U. S. Public Health Service laboratories in Cincinnati utilizing very low concentrations of Endrin in large continuous flow through tanks showed that the symptoms of dying fish were the same as those noted in the field and the Endrin levels in the blood were at or slightly below moribund specimens collected in Louisiana.

The results of the various investigations led to the Secretary of Health, Education, and Welfare issuing a call for a conference on the pollution situation in the lower Mississippi River. This conference was held May 5, 1964, at New Orleans with conferees being representatives of the U. S. Public Health Service and the pollution control agencies of Arkansas, Louisiana, Mississippi, and Tennessee. Following presentation of statements by all interested parties and consideration of all available data, the conclusions reached by the majority of the conferees included:

1. The pesticide Endrin was responsible for the fish kill observed in the Mississippi and Atchafalaya rivers in Louisiana during the fall and winter of 1963-1964.
2. Industrial wastes and drainage from contaminated areas in and near Memphis, Tennessee, are sources of Endrin in the Mississippi River.
3. The available data demonstrates that other sources than the Memphis area, not yet identified, contribute to the Endrin found in the lower Mississippi drainage area. These sources must be identified through further study.
4. It is obvious that discharges of Endrin in the Memphis, Tennessee, area together with other unidentified discharges endanger health and welfare of persons in a state other than that or those in which such discharges originated. Such discharges are subject to abatement under the provisions of the Federal Water Pollution Control Act.

Following the conference there have been some changes in practices in areas upstream from Louisiana which have been reflected in the lower Endrin concentrations noted in monitoring the river. In addition, the sporadic kills did not occur in the Mississippi River and Atchafalaya Basin during the winter of 1964-1965.

An interesting example of a fish kill and its investigation is one that occurred in the Tangipahoa River on January 4, 1965, and extended from the state line to below Amite. The normality of stream conditions (algae, pH, temperature, dissolved oxygen, etc.) and the wide range of species killed indicated the possibility of a highly toxic material being the cause of the kill. Organic extraction and gas chromatographic analyses of water samples and fish tissues indicated the



Fish Kill Winter of 1963-64. This kill in a lateral pass of the Mississippi River extended for four miles. About 95% of the fish were menhaden.

presence of some seven or eight materials common to both. Comparison with chromatograms of pesticide standards indicated that none of these materials were common pesticides, thus seemingly eliminating agricultural practices or deliberate poisoning as possible causes. When contacted the Mississippi authorities knew of only one industry, a dye manufacturer, discharging an effluent into the Tangipahoa River drainage. They collected a large sample of the effluent and forwarded it to our laboratory for analysis. Organic extraction and gas chromatographic analysis showed the presence of the same materials found in the river water samples and fish tissues. Bioassays were run utilizing various dilutions of the effluent to determine the lowest level at which it would be toxic during 24 to 48 hours of exposure. Chromatographic analysis of toxic dilutions and tissues of fish killed in the bioassays indicated that the concentrations of the materials in the river water samples and fish tissues collected in the field represented lethal levels.

Additional fish kills of less significance have occurred throughout the state. These were caused by a number of factors such as discharge of toxic wastes, blooms of toxic algae, thermal shock, etc. One example that might be cited is a fish kill in French Fork in Rapides Parish during the summer of 1965. Low water levels and extended period

of sunshine during a drought resulted in elevation of water temperature to 100°F, a point beyond the tolerance limits of some species, and a species selective kill ensued.

WATER QUALITY PROGRAM

The Water Quality Program of the Division, begun in 1958, has continued uninterrupted with only minor modifications. Collection of some seven years of data on the Mississippi River has indicated that the intensity of sampling of the river could be reduced. Therefore, the number of samples per station has been reduced to one a month and the number of stations to eight. Several new stations have been activated to obtain baseline data before anticipated major changes in streams become realities. For example, several new stations have been activated on the Sabine River in order to check on the affects of the Toledo Bend Improvement Project. One new determination, sulfates, has been added to the parameters that have been measured since the start of the water quality program. This was done as a result of growing concern over the affects of recent or proposed additions to industrial discharge of wastes containing large amounts of sulfates.

The water quality program has been of great value to the Division and many others concerned with water uses. Almost on a daily basis reference is made to the accumulated data for evaluating the proposals for discharge submitted to the Stream Control Commission and answering inquiries from industries, consultants, and other

governmental agencies. In the setting of meaningful stream standards, as required by legislation passed in the last session of Congress, this data will prove invaluable. In fact, without it we would have to set standards by mere guess or by default allow the federal agency to set the standards to be applied to Louisiana's streams.

LOUISIANA'S RIVER BASINS

The Pearl River on the state's eastern border was the subject of intensive studies and a conference of state and federal agencies in 1962 and 1963. As a result of these studies and conference, a number of recommendations for treatment of industrial and municipal wastes were made. Most of the treatment facilities have been constructed and placed in operation during 1964 and 1965. Continued monitoring of Pearl River has shown a marked improvement in its critical water quality parameters. However, as additional industry and population come into the area, renewed efforts for pollution abatement and control will be required.

In the rivers of the Florida Parishes, Bogue Falaya, Tchefuncte, Tangipahoa, Amite, etc., improvement has been noted in most industrial and municipal waste problems with installation of treatment facilities. However, gravel mining operations continue to cause a problem with discharge of very turbid gravel wash water. This is a problem that requires constant surveillance because the conditions at a single operation may vary so greatly from day to day or week to week. At present there are charges filed against four operators.

The Ouachita River continues to show improvement in quality of industrial discharges in Louisiana. Similar improvement is to be noticed in other streams in the northern and central portions of the state with reduction of oil field brine discharges.

In the southern portion of the state there continues to be sporadic problems with oil production wastes and in addition some deterioration in streams during the sugar cane grinding season. Probably the greatest potential threat to multipurpose water use is in the rapidly expanding petrochemical industry with potential taste and odor causing pollutants. For this reason the Division hopes to acquire an additional gas chromatography unit for expanded research on and monitoring of trace amounts of organic materials. Some concern has been expressed over additions to inorganics, particularly sulfates, in the Mississippi River, but none of the parameters approach the upper limits of acceptability for multipurpose use.



Sulfate Analysis. This new parameter for the Water Quality Program is conducted by members of the staff with stop watch precision.



